REPORT RESUMES

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THE EFFECTS OF ASSESSMENT AND PERSONALIZED PROGRAMMING ON SUBSEQUENT INTELLECTUAL DEVELOPMENT OF PREKINDERGARTEN AND KINDERGARTEN CHILDREN.

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THE OBJECTIVE FOR THIS STUDY WAS TO FOSTER PREKINDERGARTEN CHILDREN'S DEVELOPMENT THROUGH A PERSONALIZED PROGRAM BASED ON ASSESSMENTS OF EACH CHILD'S DEVELOPMENTAL SKILLS, USING NEW TESTS AND INSTRUCTIONAL MATERIALS ADAPTED TO INDIVIDUAL NEEDS. OF FOUR EXPERIMENTAL CLASSES, THREE FOCUSED ON AN AREA OF WEAKNESS (MOTOR, AUDITORY-LANGUAGE, OR VISUAL,) FOR 20 MINUTES DAILY, WITHIN A FRAMEWORK OF A NURSERY SCHOOL PROGRAM. CHILDREN WITH NO WEAKNESS IN THESE AREAS WERE PLACED IN THE FOURTH GROUP WHICH FOCUSED ON COGNITIVE SKILL DEVELOPMENT. PRE-TEST AND POST-TEST DATA AND GROWTH DIFFERENCES WERE ANALYZED FOR THE SIGNIFICANCE OF DIFFERENCES AMONG THE FOUR EXPERIMENTAL CLASSES, THE COMBINED EXPERIMENTAL GROUPS, AND CONTROL GROUPS WITH AND CONTROL GROUPS WITHOUT NURSERY SCHOOL EXPERIENCE. THE DATA WERE ANALYZED SEPARATELY FOR GIRLS AND BOYS. SIGNIFICANT GAINS RESULTED FROM PROGRAMS GIVEN TO HELP OVERCOME WEAKNESSES IN THE EXPERIMENTAL CHILDREN. THE EXPERIMENTAL GROUP GREW SIGNIFICANTLY IN MORE SKILLS DEVELOPMENT AREAS THAN DID THE CONTROL GROUP. THEY ALSO GREW SIGNIFICANTLY IN SKILL AREAS NOT SPECIFICALLY PROGRAMMED. THE CONTROL CHILDREN WITH PREVIOUS NURSERY SCHOOL EXPERIENCE GAINED IN MORE SKILLS DEVELOPMENT AREAS THAN THOSE CHILDREN WITHOUT SCHOOL EXPERIENCE. IN GENERAL, GIRLS SEEMED TO BENEFIT MORE THAN BOYS FROM NURSERY SCHOOL EXPERIENCE. (LG)

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July 1967

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

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ERRATA

p. 8, line 14. For "Wilk's analysis" read "MANOVA program"
p. B-4, line 30. Ibid.
p. B-11, line 38. Ibid.
p. B-6, line 32. For "Wilk's tests of significance" read "MANOVA program"
p. B-11, line 42. Ibid.
p. B-11, line 32. For "Wilk's formula" read "MANOVA program"

CLARIFICATION

p. B-2, lines 1-5. For "the program provides....among the groups." Read "The program provides a test in terms of a p value to indicate the overall significance of correlated variables and is a safeguard against the possibility that a certain percentage of the variables might be significant only by chance. The usual t-test procedures do not provide this safeguard. The analysis further provides a set of univariate F tests which indicate the significance of each variable among the groups, assuming independence."

p. C-1, at the bottom of page add "The Wilk's lambda analyses were determined by more variables than cases. Therefore, the t-tests should be interpreted in this light."

p. D-2, add "The nature of the data precluded computing the Wilk's lambda tests simultaneously. Because of an insufficient number of degrees of freedom, four Wilk's lambda tests were required for comparisons of each class with the three groups, using five dependent variables at a time in three analyses and two dependent variables in the fourth analysis. The four Wilk's tests should not be regarded as completely independent of each other since it is conceivable that one cluster of five (or two) dependent variables could be correlated with another cluster of five dependent variables. Therefore, the data should be interpreted in this light."

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Project No. 6-1328
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Alice O. Coffman
James M. Dunlap

July 1967

The research reported herein was performed pursuant to a contract with the Office of Education, U. S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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University City, Missouri

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A.O.C.
J.M.D.

INTRODUCTION

This three year research study to determine the long range effects of individual programming based on assessment of developmental needs of prekindergarten and kindergarten children was divided into three phases:

Phase I - Prekindergarten Experiment, First Year
- Kindergarten Field Test, One Year

Phase II - Prekindergarten Experiment, Second Year
- Prekindergarten Field Test, First Year

Phase III - Prekindergarten Experiment, Third Year
- Prekindergarten Field Test, Second Year

Phase I is the subject of this report with particular attention focused on the prekindergarten experiment.

In September 1966, 277 four year olds were given a battery of tests selected to measure the five developmental skills areas including motor, auditory, visual, cognitive and language. (The tests are listed and described in Appendix E.) One hundred children were selected to make up the experimental group which attended one-half day prekindergarten classes. Personalized programs were recommended for each child in the experimental group. Children with like programs attended the same classes. As a result, four experimental classes were formed as follows: motor class (Em), auditory-language class (Ea), visual class (Ev), and cognitive class (Ec).

The children in the experimental group (E) were matched with children who were tested but did not participate in the developmental skills program to comprise two control groups: control group with nursery school (Cn) and control group with no school experience (Co). (Factors influencing matching are reported in Appendix A.)

The curriculum followed by the experimental classes emphasized the developmental skills basic to intellectual growth, but also included the usual framework of the nursery school activities which foster social, physical, and emotional maturation. Three of the classes were given a specific program of approximately twenty-minutes a day emphasizing the area of particular weakness (motor, auditory-language, or visual). The majority of the children in the cognitive class had shown no major weakness in these areas, and major emphasis for these children was put on the development of cognitive skills, such as associating, classifying, ordering, and remembering information. After six months of prekindergarten classes, the same battery of tests was readministered. This report is concerned with pretest and posttest results and posttest-pretest growth comparing children who participated in the developmental skills program with one another by class, and with the control groups.

Three research efforts among these which paved the way for the study should be noted. The first, the researches that Bloom (3) examined pointed up the importance of beginning education early when children are most amenable to change. The second, Almy (1), reviewed works of Guilford, Osgood, Hebb, and Bruner which focused on the view of intelligence as the variety of ways an individual has available for processing or organizing information, thus emphasizing that intelligence is not fixed at birth by genetic factors, but rather, intelligence emerges as it is nurtured by appropriate experiences. The third, an analyses of data from a University City school showed that out of 119 kindergarten children in a school population with an average I.Q. between 120 and 125, 46 percent of the children were functioning one year or more below their age level in one or more of the basic skills areas. In addition, other research findings and literature which showed the importance of skills development and the positive relationship of each skill area to intellectual growth are: motor, Kephart (8); multi-sensory, Montessori (10); visual, Frostig (7); cognitive, Piaget (14); and language, Vygotsky (15).

__Problem.__

Not all children receive optimal education in the traditional school program. Genetic and environmental variations among individuals result in differences in needs and in the ways of learning. School programs have not adequately recognized these differences.

Educators interested in curriculum need to know how to change the usual school environment to help every child in spite of his level of operation, his ability, and his background of experiences, to function at his own optimal rate of intellectual development, propelled by his own curiosity and desire to explore, discover, to know, and to understand.

Research findings compiled in 1964 by Bloom (3), have highlighted the startling conclusion that the child's rate of development is relatively fixed by age six, the normal age for school entrance, and that there is not much hope for later modification if the child encounters only the "traditional" school environment. Early experience is seen to be of crucial importance in determining both the rate and the final level of development.

In the traditional school, some children experience learning difficulties almost from the day they enter school, while other children are ready to learn at an advanced level long before the curriculum provides opportunity to do so. Both kinds of children are often identified in retrospect after the damage has been done, when modification or remediation of procedures is less effective than appropriate programming would have been at the start.

Techniques are available to assess the development of young children earlier than the normal school entrance age. This early assessment allows for individual programming which is adapted to the specific needs of each child.

Project Objectives.

The purposes of Phase I of the project have been:

1.) To foster increased intellectual development of prekindergarten and kindergarten children through a personalized program based on assessments of each child's developmental skills, using a new combination of tests and specially selected instructional materials, methods, and techniques adapted to individual needs; to assess, observe, and follow these children throughout the project.

2.) To begin development of a guide concerned with all facets of the project, including test selection, administration, evaluation, and interpretation; programming; in-service education; implications for the classroom; parent involvement.

3.) To begin development of project materials which would add to the effectiveness of the developmental skills programming.

4.) To report the statistical data growing out of the study of children in the prekinderten experiment.

Hypotheses.

Two hypotheses are to be tested during the three phases of the study:

1.) Prekindergarten children who are provided with a personalized program based on individual assessment of their developmental skills will increase their intellectual abilities, and will learn at a higher level than children without this program.

2.) The same prekindergarten children will retain their acquired superiority through kindergarten and the first primary year.

METHOD

The researches pertinent to the Prekindergarten Experiment, First Year are reported in three sub-studies:

1. Growth in Developmental Skills in Experimental and Control Groups (Appendix B).

2. Growth in Developmental Skills in Four Experimental Classes (Appendix C).

3. Growth in Specific Developmental Skills by Class and by Control Groups; Growth in Cognition and Expression in the Experimental Classes, the Combined Experimental Group, and the Control Groups (Appendix D).

For each sub-study, the research design, sampling technique, and method of analysis are reported below.

Growth in Developmental Skills in Experimental and Control Groups.

Research Design. Three groups of "matched" prekindergarten children comprised the subjects of the study: an experimental group which participated in the prekindergarten program (E), a control group with private nursery school experience (Cn), and a control group with no school experience (Co). (See Appendix B.) All children were individually assessed using standardized tests of skills development and intelligence and locally devised supplementary measurements. They were posttested with the same instruments after an interval of six months. The tests used in these assessments were:

The Illinois Test of Psycholinguistic Abilities (ITPA) (9)
The Peabody Picture Vocabulary Test (PPVT) (5)
The Beery-Buktenica Developmental Form Sequence (Beery) (2)
Gross Motor Observations (hopping, skipping, etc.)
Three Dimensional Auditory Discrimination Test (Aud. Disc.)

A modification of Osgood's model (12, 13) for developing intellectual abilities and the tests listed above to measure these abilities are described in Appendix E.

Sampling Technique. To maintain anonymity the 277 applicants, identified only by a code number, were divided into two reasonably "matched" groups from which to draw the experimental and control children. This was done to assure comparability of the groups for end-of-year comparisons. The children were "matched" on ITPA L.Q., PPVT I.Q., age, sex, and the public school which the child would attend kindergarten the following year. From the two groups, 104 experimental and 104 control children were selected as representative of

University City children with respect to the control variables. The experimental group was designated by chance. As withdrawals from the experimental group occurred, "matching" replacements were drawn from the control group and from the remaining 69 applicants to comprise final experimental and control groups of 100 children each. The preliminary sampling procedure was detailed in an interim report (11).

When the availability of children for further study was determined following posttesting, the groups were rematched statistically on pretests to comprise 90 experimental children (See Appendix A), 73 control children with nursery school experience, and 66 control children with no school experience. No statistically significant differences in ITPA L.Q., PPVT I.Q., or age, computed for boys and girls separately, were found among the three groups. The sampling technique is illustrated in Figure 1.

Groups Matched for Age, Sex, ITPA L.Q. and PPVT I.Q.			
Experimental Group	N	Control Groups	N
(E) Personalized skills development programs provided Two teacher aides per class	90	(Cn) Attended private nursery schools	73
		(Co) Attended no school	66

Figure 1. Sampling Technique for Experimental and Control Group Comparisons

Method of Analysis. The statistical significance of the differences among the three groups E, Cn, and Co, was computed for the four control and 15 dependent variables on the pretest, and for 17 dependent variables on the posttest and posttest-pretest growth differences.

Growth in Developmental Skills in Four Experimental Classes.

Research Design. The experimental group described in Appendix B was divided into four developmental skills classes: motor (M), auditory-language (A), visual (V), and cognitive (C) and the data were re-examined. (See Appendix C.)

Sampling Technique. The children were assigned to one of four classes following assessment of individual strengths and weaknesses. The motor, auditory-language, and visual classes were specifically organized to help children overcome a weakness in a specific skills area. The cognitive class was provided for children whose developmental skills were intact. The sampling groups are illustrated in Figure 2.

Experimental Class	N
(Em) Motor	21
(Ea) Auditory-Language	23
(Ev) Visual	21
(Ec) Cognitive	25

Figure 2. Sampling Technique for Experimental Class Comparisons

Method of Analysis. The statistical significance of differences among the four classes, M, A, V, and C was computed for 17 dependent variables on the pretest, the posttest, and posttest-pretest growth differences.

Growth in Specific Developmental Skills by Class and by Control Groups; Growth in Cognition and Expression in the Experimental Classes, the Combined Experimental Group, and the Control Groups.

Research Design. Data from the four experimental classes (M, A, V, C) described in Appendix C, the combined experimental group (E), and the control groups (Cn and Co) described in Appendix B, were reexamined for growth in specific developmental skills by class and by control group; and growth in cognition and expression in the experimental classes, the combined experimental group, and the two control groups. (See Appendix D.) Other test findings are also reported in this Appendix.

Sampling Technique. Children in four experimental classes, the combined experimental group and the control groups comprised the sampling groups illustrated in Figure 3.

Experimental Group	N	Control Groups	N
(Em) Motor Class	21	(Cn) Attended private nursery schools	73
(Ea) Auditory (Language) Class	23		
(Ev) Visual Class	21		
(Ec) Cognitive Class	25	(Co) Attended no school	66
(E) Combined Experimental Classes	90		

Figure 3. Sampling Technique for Experimental Classes, the Combined Experimental Group and the Control Groups

Method of Analysis. The statistical significance of differences of each of the four classes (M, A, V, C) with the three groups (E, Cn, Co) was computed for the 17 dependent variables on the posttest-pretest differences.

RESULTS

The prekindergarten experimental group was "matched" for age, sex, language, and intelligence with control groups with and without nursery school experience. The MANOVA (4) computer program (Appendix B-1), showed no significant differences among the groups on the control variables or on any of the pretest dependent variables either for boys or girls. The tests used are described in Appendix E.

The three prekindergarten sub-studies are reported separately.

Growth in Developmental Skills in Experimental and Control Groups.

The experimental group (E) and the control groups with and without nursery school experience (Cn and Co) were compared on pretest and posttest scores, and on posttest-pretest growth differences treating the data for boys and girls separately.

Pretest for Boys. The Wilk's analysis identified none of the four control and 15 pretest dependent variables for boys as significant among the groups (E, Cn, Co). Detailed findings are given in Appendix B.

Posttest for Boys. The MANOVA program and appropriate t-tests identified nine of the 17 posttest dependent variables for boys as significant among the groups. E boys scored significantly higher than Cn boys in seven dependent variables and significantly higher than Co boys in eight dependent variables as shown in Table 1.

Table 1. Posttests for Boys in the Experimental (E) and Control Groups with and without Nursery School Experience (Cn and Co) Compared

Dependent Variable	E higher than Cn	E higher than Co
Beery Developmental Form Sequence		X
ITPA 4 - Visual-Motor Association	X	X
ITPA 5 - Vocal Encoding	X	X
ITPA L.Q. - Composite Score	X	X
Hopping-Right Foot	X	X
Hopping-Left Foot	X	X
Skipping	X	X
Total Motor Score	X	X

Cn boys scored significantly higher than E boys on ITPA 8 - Auditory-Vocal Sequencing. (Comparisons of Cn with Co boys, which are of interest but not of immediate concern in this study, are reported only in Appendix B.)

Posttest-Pretest Growth of Boys. The MANOVA program and appropriate t-tests identified four posttest-pretest dependent growth variables for boys as significant among the groups. E boys showed significantly greater growth than Cn boys in three dependent variables and significantly greater growth than Co boys in four dependent variables as shown in Table 2.

Table 2. Posttest-Pretest Growth for Boys in the Experimental Group (E) and Control Groups with and without Nursery School Experience (Cn and Co) Compared

Dependent Variable	E greater than Cn	E greater than Co
ITPA 5 - Vocal Encoding	X	X
ITPA 6 - Motor Encoding	X	X
ITPA L.Q. - Composite Score		X
Skipping	X	X

Pretest for Girls. The MANOVA program identified no control or pretest dependent variables for girls as significant among the groups.

Posttest for Girls. The MANOVA program and appropriate t-tests identified six posttest dependent variables for girls as significant among the groups. E girls scored significantly higher than Cn girls on five dependent variables and significantly higher than Co girls in six dependent variables as shown in Table 3.

Table 3. Posttests for Girls in the Experimental (E) and Control Groups with and without Nursery School Experience (Cn and Co) Compared

Dependent Variable	E higher than Cn	E higher than Co
Beery Developmental Form Sequence	X	X
ITPA 5 - Vocal Encoding	X	X
Hopping-Right Foot		X
Hopping-Left Foot	X	X
Skipping	X	X
Total Motor Score	X	X

Posttest-Pretest Growth of Girls. The MANOVA program and appropriate t-tests identified seven posttest-pretest dependent growth variables for girls as significant among the groups. E girls showed significantly greater growth than Cn girls in two dependent variables and significantly greater growth than Co girls in seven dependent variables as shown in Table 4.

Table 4. Posttest-Pretest Growth for Girls in the Experimental Group (E) and Control Groups with and without Nursery School Experience (Cn and Co) Compared

Dependent Variable	E greater than Cn	E greater than Co
Beery Developmental Form Sequence	X	X
ITPA 1 - Auditory Decoding		X
ITPA 5 - Vocal Encoding	X	X
ITPA L.Q. - Composite Score		X
Hopping-Right Foot		X
Skipping		X
Total Motor Score		X

Growth in Developmental Skills in Four Experimental Classes.

The four developmental skills classes--motor (M), auditory including language (A), visual (V), and cognitive (C) were compared on pretest and posttest results, and on posttest-pretest growth differences treating the findings for boys and girls separately. Detailed data are reported in Appendix C.

Pretest Results for Boys. The MANOVA program and appropriate t-tests identified 12 of the 17 pretest dependent variables for boys as significant among the classes (M, A, V, C).

M Pretest for Boys. M boys scored significantly higher than A boys in five dependent variables as shown in Table 5.

Table 5. Pretests for Boys in the Motor (M) Class Compared when Significant with Boys in the Other Classes

Dependent Variable	M higher than A
ITPA 1 - Auditory Decoding	X
ITPA 3 - Auditory-Vocal Association	X
ITPA 5 - Vocal Encoding	X
ITPA L.Q. - Composite Score	X
Auditory Discrimination	X

A Pretest for Boys. A boys scored significantly higher than M boys in two dependent variables as shown in Table 6.

Table 6. Pretests for Boys in the Auditory-Language (A) Class Compared when Significant with Boys in the Other Classes

Dependent Variable	A higher than M
Hopping-Left Foot	X
Total Motor Score	X

V Pretest for Boys. V boys scored significantly higher than M boys in four dependent variables and significantly higher than A boys in eight dependent variables as listed in Table 7.

Table 7. Pretests for Boys in the Visual (V) Class Compared when Significant with Boys in the Other Classes

Dependent Variable	V higher than M	V higher than A
ITPA 1 - Auditory Decoding		X
ITPA 3 - Auditory-Vocal Association	X	X
ITPA 5 - Vocal Encoding		X
ITPA 7 - Auditory-Vocal Automatic	X	X
ITPA 8 - Auditory-Vocal Sequencing		X
ITPA L.Q. - Composite Score		X
Hopping-Left Foot	X	
Total Motor Score	X	
PPVT I.Q. - Mental Ability		X
Auditory Discrimination		X

C Pretest for Boys. C boys scored significantly higher than M boys in ten dependent variables, significantly higher than A boys in ten dependent variables, and significantly higher than V boys in three dependent variables as shown in Table 8.

Table 8. Pretests for Boys in the Cognitive (C) Class Compared when Significant with Boys in the Other Classes

Dependent Variable	C higher than M	C higher than A	C higher than V
Beery Developmental Form Sequence	X	X	X
ITPA 1 - Auditory Decoding	X	X	
ITPA 3 - Auditory-Vocal Association	X	X	
ITPA 5 - Vocal Encoding		X	
ITPA 7 - Auditory-Vocal Automatic	X	X	
ITPA 8 - Auditory-Vocal Sequencing	X	X	X
ITPA 9 - Visual-Motor Sequencing	X	X	X
ITPA L.Q. - Composite Score	X	X	
Hopping-Left Foot	X		
Total Motor Score	X		
PPVT I.Q. Mental Ability	X	X	
Auditory Discrimination		X	

Posttest Results for Boys. The MANOVA program and appropriate t-tests identified nine of the 17 posttest dependent variables for boys as significant among the classes (M, A, V, C).

M Posttest for Boys. M boys scored significantly higher than A boys in three dependent variables as shown in Table 9.

Table 9. Posttest for Boys in the Motor (M) Class Compared when Significant with Boys in the Other Classes

Dependent Variable	M higher than A
ITPA 7 - Auditory-Vocal Automatic	X
ITPA L.Q. - Composite Score	X
PPVT I.Q. Mental Ability	X

A Posttest for Boys. A boys did not score significantly higher than M, V, or C boys in any of the nine dependent variables.

V Posttest for Boys. V boys scored significantly higher than M boys in four dependent variables and significantly higher than A boys in seven dependent variables as shown in Table 10.

Table 10. Posttest for Boys in the Visual (V) Class Compared when Significant with Boys in the Other Classes

Dependent Variable	V higher than M	V higher than A
ITPA 3 - Auditory-Vocal Association	X	X
ITPA 5 - Vocal Encoding	X	X
ITPA 7 - Auditory-Vocal Automatic	X	X
ITPA 8 - Auditory-Vocal Sequencing		X
ITPA L.Q. - Composite Score		X
Skipping	X	X
PPVT I.Q. Mental Ability		X

C Posttest for Boys. C boys scored significantly higher than M boys in eight dependent variables, significantly higher than A boys in all nine dependent variables, and significantly higher than V boys in three dependent variables as shown in Table 11.

Table 11. Posttest for Boys in the Cognitive (C) Class Compared when Significant with Boys in the Other Classes

Dependent Variable	C higher than M	C higher than A	C higher than V
Beery Developmental Form Sequence	X	X	X
ITPA 3 - Auditory-Vocal Association	X	X	X
ITPA 5 - Vocal Encoding	X	X	
ITPA 7 - Auditory-Vocal Automatic	X	X	
ITPA 8 - Auditory-Vocal Sequencing	X	X	
ITPA 9 - Visual-Moter Sequencing	X	X	X
ITPA L.Q. - Composite Score	X	X	
Skipping	X	X	
PPVT I.Q. Mental Ability		X	

Posttest-Pretest Growth of Boys. The MANOVA program and appropriate t-tests identified four of the 17 posttest-pretest dependent growth variables for boys as significant among the classes.

M Posttest-Pretest Growth of Boys. M boys showed significantly greater growth than A, V, and C boys in one dependent variable, total motor score.

A Posttest-Pretest Growth of Boys. A boys showed significantly greater growth than M boys in one dependent variable, significantly greater growth than V boys in one dependent variable, significantly greater growth than C boys in two dependent variables as shown in Table 12.

Table 12. Posttest-Pretest Growth for Boys in the Auditory-Language (A) Class Compared when Significant with Boys in the Other Classes

Dependent Variable	A greater than M	A greater than V	A greater than C
ITPA 3 - Auditory-Vocal Association		X	X
Auditory Discrimination	X		X

V Posttest-Pretest Growth of Boys. V boys showed significantly greater growth than C boys in one dependent variable, ITPA 2 - Visual Decoding.

C Posttest-Pretest Growth of Boys. C boys did not show significantly greater growth than M, A, or V boys in any of the four dependent variables.

Pretest Results for Girls. The MANOVA program and appropriate t-tests identified age and 13 of the 17 pretest dependent variables for girls as significant among the classes (M, A, V, C).

M Pretest for Girls. M girls scored significantly higher than V girls in one dependent variable, ITPA 2 - Visual Decoding.

A Pretest for Girls. A girls scored significantly higher than M girls in age and five dependent variables, significantly higher than V and C girls in one dependent variable as shown in Table 13.

Table 13. Pretests for Girls in the Auditory-Language (A) Class Compared when Significant with Girls in the Other Classes

Age and Dependent Variable	A higher than M	A higher than V	A higher than C
Age	X		
ITPA 2 - Visual Decoding		X	
ITPA 6 - Motor Encoding	X		X
Hopping-Right Foot	X		
Hopping-Left Foot	X		
Skipping	X		
Total Motor	X		

V Pretest for Girls. V girls scored significantly higher than M girls in age and 11 dependent variables, significantly higher than A girls in three dependent variables, and significantly higher than C girls in one dependent variable as shown in Table 14.

Table 14. Pretests for Girls in the Visual (V) Class Compared when Significant with Girls in the Other Classes

Age and Dependent Variable	V higher than M	V higher than A	V higher than C
Age	X		
ITPA 1 - Auditory Decoding	X		
ITPA 3 - Auditory-Vocal Association	X	X	
ITPA 5 - Vocal Encoding	X		
ITPA 6 - Motor Encoding			X
ITPA 7 - Auditory-Vocal Automatic	X	X	
ITPA 8 - Auditory-Vocal Sequencing	X		
ITPA 9 - Visual-Motor Sequencing	X		
ITPA L.Q. - Composite Score	X	X	
Hopping-Right Foot	X		
Hopping-Left Foot	X		
Skipping	X		
Total Motor Score	X		

C Pretest for Girls. C girls scored significantly higher than M girls in age and 11 dependent variables, significantly higher than A girls in six dependent variables, and significantly higher than V girls in two dependent variables as shown in Table 15.

Table 15. Pretests for Girls in the Cognitive Class (C) Compared when Significant with Girls in the Other Classes

Age and Dependent Variable	C higher than M	C higher than A	C higher than V
Age	X		
ITPA 1 - Auditory Decoding	X	X	
ITPA 2 - Visual Decoding	X	X	X
ITPA 3 - Auditory-Vocal Association	X	X	
ITPA 7 - Auditory-Vocal Automatic	X	X	
ITPA 8 - Auditory-Vocal Sequencing	X		
ITPA 9 - Visual-Motor Sequencing	X	X	X
ITPA L.Q. - Composite Score	X	X	
Hopping-Right Foot	X		
Hopping-Left Foot	X		
Skipping	X		
Total Motor Score	X		

Posttest Results for Girls. The MANOVA program and appropriate t-tests identified three of the 17 posttest dependent variables for girls as significant among the classes (M, A, V, C).

M Posttest for Girls. M girls did not score significantly higher than A, V, or C girls in any of the three dependent variables.

A Posttest for Girls. A girls did not score significantly higher than M, V, or C girls in any of the three dependent variables.

V Posttest for Girls. V girls scored significantly higher than M girls in all three dependent variables and significantly higher than A girls in one dependent variable as shown in Table 16.

Table 16. Posttests for Girls in the Visual (V) Class Compared when Significant with Girls in the Other Classes

Dependent Variable	V higher than M	V higher than A
Beery Developmental Form Sequence	X	X
ITPA 3 - Auditory-Vocal Association	X	
ITPA 7 - Auditory-Vocal Automatic	X	

C Posttest for Girls. C girls scored significantly higher than M and A girls in all three dependent variables as shown in Table 17.

Table 17. Posttests for Girls in the Cognitive (C) Class Compared when Significant with Girls in the Other Classes

Dependent Variable	C higher than M	C higher than A
Beery Developmental Form Sequence	X	X
ITPA 3 - Auditory-Vocal Association	X	X
ITPA 7 - Auditory-Vocal Automatic	X	X

Posttest-Pretest Growth of Girls. The MANOVA program and appropriate t-tests identified three of the 17 posttest-pretest dependent growth variables for girls as significant among the classes.

M Posttest-Pretest Growth of Girls. M girls showed significantly greater growth than A and V girls in one dependent variable, and significantly greater growth than C girls in all three dependent variables as shown in Table 18.

Table 18. Posttest-Pretest Growth of Girls in the Motor (M) Class Compared when Significant with Girls in the Other Classes

Dependent Variable	M greater than A	M greater than V	M greater than C
ITPA 2 - Visual Decoding			X
ITPA 9 - Visual-Motor Sequencing			X
Total Motor Score	X	X	X

A Posttest-Pretest Growth of Girls. A girls showed significantly greater growth than C girls in two dependent variables as shown in Table 19.

Table 19. Posttest-Pretest Growth of Girls in the Auditory-Language (A) Class Compared when Significant with Girls in the Other Classes

Dependent Variable	A greater than C
ITPA 2 - Visual Decoding	X
ITPA 9 - Visual-Motor Sequencing	X

V Posttest-Pretest Growth of Girls. V girls showed significantly greater growth than M and A girls on one dependent variable, and significantly greater growth than C girls in three dependent variables as shown in Table 20.

Table 20. Posttest-Pretest Growth of Girls in the Visual (V) Class Compared when Significant with Girls in the Other Classes

Dependent Variable	V greater than M	V greater than A	V greater than C
ITPA 2 - Visual Decoding	X	X	X
ITPA 9 - Visual-Motor Sequencing			X
Total Motor Score			X

C Posttest-Pretest Growth of Girls. C girls did not show significantly greater growth than M, A, or V girls in any of the dependent variables.

Growth in Specific Developmental Skills by Class and By Control Groups; Growth in Cognition and Expression for the Experimental Classes, the Combined Experimental Group, and the Control Groups.

Comparisons were made among the four experimental classes--motor (Em), auditory-language (Ea), visual (Ev), and cognitive (Ec); the combined experimental group (E) and the control groups with and without nursery school experience (Cn and Co) for boys and girls separately. (See Appendix D.) Only the dependent variables identified by the Wilk's test of overall significance of p less than .05 were used in the comparisons as indicated in Table D-1. In all instances where the univariate F test for the dependent variables was p less than .05, t-test data for those variables are given in Tables D-2 and D-3.

Growth in Developmental Skills by Class Compared with Control Groups. The dependent variables selected for this aspect of the study for each class were:

Motor Class (Em) - Total Motor Test
Auditory-Language Class (Ea) - ITPA 5, Vocal Encoding
Visual Class (Ev) - Beery
Cognitive Class (Ec) - ITPA 4, Visual-Motor Association

Tables D-4 and D-5 and Figures D-2 and D-3 present these data.

Motor Class. Both Em boys and Em girls made significantly greater gains than the control children (Cn and Co). The difference between the control groups was not significant.

Auditory-Language Class. Both Ea boys and Ea girls made significantly greater gains than the control children (Cn and Co). The differences between the control groups was not significant.

Visual Class. Both Ev boys and Ev girls made significantly greater gains than the control children (Cn and Co). The difference between the control groups also was significant for boys but was not significant for girls.

Cognitive Class. Ec boys made significantly greater gains than Cn and Co boys. Ec girls gained more than Cn and Co girls but the difference in the latter instance was not significant. The difference between the control children also was not significant.

Growth in Cognition of the Experimental Classes, the Combined Experimental Group and the Control Groups. The four experimental classes (Em, Ea, Ev, Ec) and the combined experimental group (E) were compared with the control groups (Cn and Co). The dependent growth variables measuring cognition were:

ITPA 4 - Visual-Motor Association
ITPA L.Q. - Composite score
PPVT I.Q. - Mental ability

Tables D-4 and D-5 and Figures D-5 and D-6 present these data.

ITPA 4 for Boys. Ec boys showed significantly greater growth than both Cn and Co boys; Em and E boys showed significantly greater growth than Co boys only; Ev and E boys growth differences among the other classes or groups were not significant.

ITPA 4 for Girls. No growth differences were significant for any class or group.

ITPA L.Q. for Boys. Em, Ev, and E boys showed significantly greater growth than Co boys while other growth differences were not significant.

ITPA L.Q. for Girls. Em girls showed significantly greater growth than both Cn and Co girls; Ea, Ec, E, and Cn girls showed significantly greater growth than Co girls. The other growth differences were not significant.

PPVT I.Q. for Boys. No growth differences were significant for any class or group.

PPVT I.Q. for Girls. Em, Ev, and E girls showed significantly greater growth than both Cn and Co girls. The other growth differences were not significant.

Growth in Expression of the Experimental Classes, the Combined Experimental Group and the Control Groups. Growth in expression in the four experimental classes (Em, Ea, Ev, Ec) and the three groups (E, Cn, Co) was also examined. ITPA 5, Visual Encoding, was used as the dependent variable. Tables D-4 and D-5 and Figures D-5 and D-6 present these data.

ITPA 5 for Boys. Ea and E boys showed significantly greater growth than both Cn and Co boys; Ev and Ec boys showed significantly greater growth than Co boys. The growth difference between Em and Cn boys and Co boys was not significant.

ITPA 5 for Girls. All girls in the experimental classes (Em, Ea, Ev, Ec) and the combined experimental group (E) showed greater growth than Cn and Co girls; the growth differences between Cn and Co girls was not significant.

Growth in Areas Other than these Specifically Programmed. The only experimental sub-group of boys showing significant growth in an area other than that specifically programmed were the boys in the cognitive class who made a significant gain in the motor area.

Experimental girls in the motor class showed significant growth in three additional developmental skills areas (auditory, visual, and cognitive). Girls in the auditory-language class showed significant growth in one additional developmental skill area (cognitive). Girls in the visual class showed significant growth in one additional developmental skill area (motor). Girls in the cognitive class showed significant gain in the motor area, but a significant loss in the visual area.

DISCUSSION

Findings are discussed separately by pretest, posttest, and posttest-pretest growth differences by the combined experimental group (E), the experimental classes--motor (Em), auditory-language (Ea), visual (Ev), cognitive (Ec)--and the control groups with and without nursery school experience (Cn and Co).

Pretest Analysis.

The three groups, E, Cn, and Co, were originally matched on age, sex, ITPA L.Q., and PPVT I.Q. In addition, the 15 dependent variables showed no statistically significant differences among the three groups. Because the four classes were organized to meet specific strengths and weaknesses, children in these classes were not matched. Ec boys scored highest on the largest number of pretests followed in order by Ec girls, Ev girls, Ev boys, Ea girls, Em boys, Ea boys, and Em girls. The children in the Ec class excelled those in the Ev class but both classes far excelled children in the Ea and Em classes.

Posttest Analysis.

Posttest data were considered separately for the three groups (E, Cn, Co), the four experimental classes (Em, Ea, Ev, Ec).

Group Posttest Comparisons. E boys scored significantly higher than both Cn and Co boys on seven posttests and higher than Co boys on one additional posttest. E girls scored significantly higher than both Cn and Co girls on five posttests and higher than Co girls on one additional posttest. Cn boys scored significantly higher than Co boys on one posttest while Cn and Co girls showed no significant differences. Cn boys unexpectedly scored significantly higher than E boys on one test (ITPA 8, Auditory-Vocal Sequencing). This finding may have resulted from lack of emphasis on low meaning immediate memory activities in the overall experimental program.

Experimental Class Posttest Comparisons. Ec boys scored significantly higher on more of the posttests, surpassing the boys in the other three classes; Ev boys surpassed the boys in two classes; Em boys surpassed the boys in one class; and Ea boys did not surpass any other class.

Ec girls scored significantly higher on more posttests, surpassing the girls in two other classes and Ev girls also surpassed the girls in two other classes but not on as many posttests. Neither Ea or Em girls surpassed the girls in any class.

The classes remained in the same order and comparable strength on the posttest as on the pretest with respect to the number of tests on which boys scored higher. Ec and Ev girls also maintained the same order and comparable strength on the pretest and posttest. Neither Em or Ea girls yet approached Ec and Ev girls in skills development.

Posttest-Pretest Growth Differences Analysis.

Posttest-Pretest Growth data were considered separately for the three groups (E, Cn, Co) and the four experimental classes (Em, Ea, Ev, Ec).

Group Posttest-Pretest Growth Comparisons. E boys showed significantly greater growth than Cn and Co boys on three posttest-pretest differences and greater growth than Co boys on one additional difference. No significant growth differences for boys were found between the control groups. E girls showed significantly greater growth than Cn and Co girls on two posttest-pretest differences and greater growth than Co girls on five additional differences. Cn girls surpassed Co girls on three growth differences.

In the overall experimental program, girls gained significantly more in developmental skills than boys but both boys and girls gained more than children in either control group. However, girls who attended nursery school gained more than girls with no school experience, while nursery school boys showed no greater gain than boys who remained at home. Apparently both the experimental and the nursery school programs benefited girls more than boys.

Experimental Classes with Control Groups Posttest-Pretest Growth Comparisons.

All classes were provided activities planned to develop total growth. In addition, three of the classes (Em, Ea, Ev) received a program to strengthen a specific weakness. The four class (Ec) emphasized cognitive skills. For each class, one test was selected to measure the skill emphasized in that class. A second or third test of the same skill was available in some instances. Other tests of skill not specifically programmed also were significant. All significant tests are reported in the following discussion which compared each experimental class with the control groups.

Motor Class. The Em class made significant growth in a greater number of skills than Ev, Ec, or Ea. Em boys gained more than Cn and Co boys in a test selected to measure the skill specifically programmed. They also gained more than Co boys in two tests of cognition. Em girls gained more on a test measuring the skill specifically programmed than Cn and Co girls. They also gained more than Cn and Co girls on one test of auditory, three tests of cognition, and one test of language. In addition, Em girls gained more than Co girls on one test of visual skills.

Visual Class. The Ev class made significant growth in a greater number of skills than Ec or Ea. Ev boys gained more than Cn or Co boys in a test measuring the skill specifically programmed. They also gained more than Cn or Co girls in the test measuring the skill specifically programmed. They also gained more than Cn and Co girls in one test of cognition and one test of language. Moreover, Ev girls gained more than Co girls in one test of motor skills.

Cognitive Class. The Ec class made significant growth in a greater number of skills than the Ea class. Ec boys gained more than Cn or Co boys in a test measuring the skill specifically programmed. They also gained more than Cn and Co boys in one test of motor skills. In addition Ec boys gained more than Co boys in one test of language. Ec girls gained more than Co girls in a test measuring the specific skill programmed. They also gained more than Cn and Co girls in one test of language. Ec girls were the only subgroup in which both Cn and Co girls made a significantly greater gain. This occurred in one test of visual skills.

Auditory-Language Class. Ea boys made significantly greater growth than Cn and Co boys in a test measuring the skill specifically programmed. Ea girls gained more than Cn and Co girls in a test measuring the skill specifically programmed. They also gained more than Cn and Co girls in one test of cognition. Moreover, Ea girls gained more than Co girls in a second test of cognition.

Children with no differences on the pretest showed many differences on the posttest accounting for growth in skills development.

The results indicated that children given a program designed to help overcome a weakness made significant gains compared with children in the control groups. They grew significantly in a number of skill areas not specifically programmed as well. The experimental group as a whole also made significant gains in more skills development areas than the control groups. The control group with nursery school experience showed gains in more skills development areas than children who attended no school. Throughout the study, sex differences appeared. In general, girls seemed to benefit more than boys by attending either the prekindergarten program or a good nursery school.

Five inconsistencies (Beery and ITPA 4 for boys; PPVT I.Q., ITPA 6, and ITPA 9 for girls) occurred in Appendixes B and D because the data required different statistical treatments. In Appendix B comparisons were made among the combined experimental group, the control group with nursery school experience, and the control group with no school experience. In Appendix D, comparisons were made for each experimental class (Em, Ea, Ev, Ec) with the combined experimental group and with the two control groups. The resulting figures showed significant differences in Appendix D but not in Appendix B.

CONCLUSIONS

The developmental skills program seemed to be effective in areas of specific programming for boys in each of the four experimental classes and for girls in three of the classes. In the area of language, the program seemed to be effective for girls in each of the four classes and for boys in three of the classes. The program also seemed to be effective in the area of cognition for girls in four classes and for boys in three classes.

When findings for the experimental classes were combined and compared with the control groups, the effect of the specific programs was, of course, less apparent. However, the experimental group of boys showed significant growth in the areas of motor, cognition, and language. Experimental girls showed significant growth in each of the developmental skills areas (motor, auditory, visual, cognition, and language). Control boys with nursery school experience showed significant growth only in the visual area and control girls with nursery school experience showed significant growth only in the area of cognition. Control boys and girls with no nursery school experience showed no significant growth in any developmental skills area.

The experimental cognitive class scored highest among the four classes on the pretest and the posttest. The experimental motor class which scored low on the pretests showed the most overall growth in skills. Girls appeared to make greater skills growth than boys in both the experimental group and the control group with nursery school experience.

Weaknesses seemed to be strengthened by the development of skills in the area specifically emphasized. The motor, auditory, and visual programs appeared to have more effect on growth in cognition for girls than an emphasis upon the development of cognitive skills. For boys, the motor program seemed to have more effect on growth in cognition than an emphasis upon cognitive skills. However, the long range effect of the emphasis on cognitive skills in the cognitive class will not be known until the children undertake the mastery of the more formal skills of learning which will be measured during Phase III of this study. It is hoped, too, that evidence will be forthcoming to show whether or not the developmental skills program geared to meet the needs of each child will have a positive relationship with later success in school.

SUMMARY

Not all children receive optimal education in a traditional school program. Recent researches have pointed to the variety of ways of learning available to children, the importance of skills development, the relationship of each skill area to intellectual growth, and the need to begin education early when children are most amenable to change.

The objective of this study was to foster intellectual development of prekindergarten children through a personalized program based on assessments of each child's developmental skills, using a new combination of tests and specially selected instructional materials, methods, and techniques adapted to individual needs. The skills development program was conducted within the usual framework of nursery school activities to promote social, physical, and emotional maturation.

Four classes were organized, three of which focused on an area of specific weakness (motor, auditory-language, or visual) for approximately twenty minutes each day. The majority of children in the cognitive class, having shown no major weakness in these areas, were given a program to develop cognitive skills.

Pretest and posttest data and posttest-pretest growth score differences were examined statistically to determine the significance of differences among four experimental classes (motor, auditory including language, visual, and cognitive), the combined experimental group, and control groups with and without nursery school experience, separately for boys and girls.

The results indicated that children given a program designed to help overcome a weakness made significant gains compared with children in the control groups. They grew significantly in a number of skill areas not specifically programmed as well. The experimental group as a whole also made significant gains in more skills development areas than the control groups. The control group with nursery school experience showed gains in more skills development areas than children who attended no school. Throughout the study, sex differences appeared. In general, girls seemed to benefit more than boys by attending either the prekindergarten program or a good nursery school.

The data suggest the importance and effectiveness of early education with special emphasis on skills development. Locally, the findings point to the need to modify for boys some aspects of the program. Children in the cognitive class scored high on both the pretests and posttests and showed less posttest-pretest growth than children in the three other classes. This fact may mean that more emphasis should have been devoted to skills development in conjunction with cognitive activities. Two additional years are needed to determine at the end of the first primary year in school whether or not these children will maintain their lead in intellectual ability and in achievement.

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APPENDIX A

RE-MATCHING THE EXPERIMENTAL AND CONTROL GROUPS: THE FACTOR OF ATTENDANCE

Attendance of the Total Group.

The Prekindergarten Research Study is predicated on the hypothesis that the improvement of skills is dependent in part on participation during the school day in appropriate skills development activities, attendance thus being one important factor in the investigation of outcomes.

The experimental and control groups were tentatively matched in October 1966 on the basis of age, sex, kindergarten to be attended later, and two test quotients (11). Enrollment changes and instances of control children moving from the school district required re-matching prior to processing the posttest data.

In the experimental group, classes had operated 114 days as of April 21, 1967. During the first week of operation only five children entered school each day, the span of four days allowing the typical child a possible perfect attendance of only 112 days. The number of days present is given in Table A-1.

Of the 100 children finally designated as the experimental group (11), three have left the area. The remaining 97 children attended school from 100 to 42 percent of the time. Ninety children (92.7 percent) were present at least 85 days or 78 percent of the class sessions. Seven children (7.2 percent) attended 69 days or fewer, or from 60 to 42 percent of the sessions. The obvious division between children with good and poor attendance identified those children who were present 85 days or more to be included in the assessment of posttest results. The children in the good attendance group, with five exceptions, fell statistically between plus and minus one standard deviation; those in the poor attendance group, with two exceptions, fell three standard deviations or more below the mean for attendance. For the 90 children with good attendance, the mean was 102.0 and the median was 103.4 days present; for the seven children in with poor attendance the mean was 56.7, and the median was 56.0 days present. The mean attendance for the total group was 98.7 days present, the median was 102.6 days present.

Table A-1. Attendance of Children in Experimental Group

Number of Days Present	Children			Percentage of Days Present (Cumulative)
	Number	Cumulative Percentage		
114 - 110	12	12.4		100
109 - 105	21	34.0	Read Down	96
104 - 100	30	64.9		91
99 - 95	11	76.2		87
94 - 90	11	87.5		82
89 - 85	5	92.7	↓	78
84 - 80	0			
79 - 75	0			
74 - 70	0			
69 - 65	1	7.2	↑	60
64 - 60	1	6.2		55
59 - 55	2	5.2		51
54 - 50	2	3.1	Read Up	46
49 - 45	1	1.0		42
Total	97	99.9		100

Median Days Present 102.6
Mean Days Present 98.7

Attendance by Class and Sex.

Comparisons of the mean and median number of days present for boys and girls separately and combined in each of the four classes are given in Table A-2. Although the statistical significance of the data was not calculated, observation of the figures show remarkable consistency.

It is interesting to note that, with the exception of the motor class, boys had slightly better attendance than girls, approximately one day difference on the average for the combined groups.

Table A-2. Attendance of Experimental Children by Class and Sex

Group	Number of Days Present			
	Motor	Audit.-Lang.	Visual	Cognitive
BOYS	(13)*	(13)	(11)	(11)
Mean	93.7	98.5	100.0	102.9
Median	99.0	102.0	101.0	104.0
GIRLS	(10)	(12)	(12)	(15)
Mean	101.4	98.3	95.4	100.3
Median	103.0	102.5	99.0	106.0
TOTAL	(23)	(25)	(23)	(26)
Mean	97.0	98.4	97.6	101.4
Median	101.0	102.0	101.0	104.0

Reasons for Absence.

Absences were surprisingly infrequent considering the travel distance (possibly two to three miles) to the experimental school and the susceptability of young children to colds and more prolonged illnesses. The transportation problem was further complicated by a minor traffic accident occurring in one parent-arranged car pool followed by a delay in finding another driver. Table A-3 provides data on reasons for absence.

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*Number of children.

Table A-3. Number of Children in the Good and Poor Attendance Groups Compared by Reasons for Absence

Reason for Absence	Class				
	Motor	Aud.-Lang.	Visual	Cognitive	Total
GOOD ATTENDANCE GROUP*					
Illness	0	3	1	3	7
Transportation	0	2	0	0	2
Subtotal	0	5	1	3	9
POOR ATTENDANCE GROUP**					
Illness	0	0	0	1	1
Transportation	2	2	2	0	6
Subtotal	2	2	2	1	7
COMBINED GROUPS					
Illness	0	3	1	4	8
Transportation	2	4	2	0	8
TOTAL	2	7	3	4	16

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*Includes only children present between 78 and 89 percent of school days.

**Includes children present 60 percent or fewer school days.

APPENDIX B

GROWTH IN DEVELOPMENTAL SKILLS IN EXPERIMENTAL AND CONTROL GROUPS

Hypothesis.

Prekindergarten children who are provided with a personalized program based on individual assessment of their developmental skills will show greater growth in skills than children without this program as measured by standardized tests after a period of six months.

Independent Variable.

Participation or non-participation in the experimental prekindergarten constituted the independent variable. Children in three groups--an experimental group which participated in the prekindergarten program (E), a control group with private nursery school experience (Cn), and a control group with no school experience (Co)--were the subjects.

Control Variables.

The three groups were matched statistically on the Illinois Test of Psycholinguistic Abilities (ITPA) L.Q. and the Peabody Picture Vocabulary Test (PPVT) I.Q. pretests, age, and sex.

Dependent Variables.

Seventeen pretest and posttest measures of skills development were investigated. They included ITPA raw scores for subtests 1-9 and total L.Q., the Beery-Buktenica Developmental Form Sequence (Beery) raw score, three gross motor subtests and total raw scores, a three-dimensional auditory discrimination test (Aud.-Disc.) raw score, and the PPVT I.Q.

Analyses.

The statistical significance of mean score differences among the experimental (E) and two control groups (Cn and Co) was computed for four control and 15 dependent variables on the pretest and for 17 dependent variables on the posttest and on posttest-pretest growth differences using the MANOVA program (4). This analysis provides tests of significance using Wilk's lambda criterion and canonical correlations to establish overall significance of the data. The MANOVA program is a more severe test than the usual related or unrelated t-test procedures (6) because it processes all variables simultaneously. The program provides an F test in terms of a p value to indicate the percentage of variables which might be significant only by chance. The usual t-test does not provide this safeguard. The analysis further provides a univariate F test which indicates the significance of each variable among the groups.

Results.

The findings are reported for the pretest and posttest scores, and for posttest-pretest growth differences separately for boys and girls.

Pretest Differences for Boys.

In the MANOVA program (4), the Wilk's tests of overall significance showed p less than .001 for boys, thereby justifying rejection at this level of the null hypothesis (upon which the analyses are based) that no differences among experimental (E) and control (Cn and Co) groups existed. The resulting univariate F tests showed no significant differences among the groups on any of the control or dependent pretest variables. By way of caution, E, Cn, and Co groups had been matched in October 1966 on pretest ITPA L.Q., and PPVT I.Q., age, and sex, and were rematched on the same control variables when the availability of children for further study was determined following posttesting. With this procedure, some differences in the 17 dependent variables might have been expected. This was not the case as no statistically significant differences among the E, Cn, and Co groups were found on any control or pretest dependent variables. Table B-1 provides pretest data on raw score, age score, and standard deviation (S.D.) from the mean for boys. Age score and S.D. figures were taken from publishers' manuals when available. Otherwise local data were computed.

Table B-1. Pretest Raw Score, Age Score, and Standard Deviation (S.D.) Data for Boys

Dependent Variable	Experiment (E)			Control(Cn)			Control (Co)		
	Mean Age: 4-5			Mean Age: 4-6			Mean Age: 4-5		
	Raw Score	Age Score	S.D.	Raw Score	Age Score	S.D.	Raw Score	Age Score	S.D.
Beery	5.42	4-5	-.04	5.78	4-6	-.10	5.19	4-4	-.14
ITPA 1*	17.13	5-0	.57	17.28	5-0	.57	15.84	4-9	.39
ITPA 2*	9.02	4-9	.20	9.19	4-9	.20	8.91	4-9	.20
ITPA 3*	12.20	4-8	.50	12.72	4-11	.77	12.03	4-8	.50
ITPA 4*	10.42	4-4	.04	9.00	4-0	-.17	10.19	4-4	.04
ITPA 5*	11.56	5-1	.44	9.72	4-5	-.11	10.94	4-9	.16
ITPA 6*	10.76	4-7	-.19	11.09	4-7	-.19	10.91	4-7	-.19
ITPA 7*	9.00	5-0	.28	8.97	5-0	.28	9.06	5-0	.28
ITPA 8*	16.71	4-10	.37	17.13	4-10	.37	15.50	4-7	.17
ITPA 9*	7.82	4-4	-.13	8.00	4-4	-.13	7.75	4-4	-.13
ITPA L.Q.*	107.07	4-9	.44	105.28	4-8	.31	105.66	4-8	.38
Hopping-Right	1.24	-	.41	.84	-	-.09	1.06	-	.21
Hopping-Left	1.47	-	.42	1.19	-	.25	1.06	-	-.04
Skipping	.69	-	.02	.47	-	-.18	.41	-	-.25
Total Motor	17.42	-	.30	16.50	-	.19	16.06	-	.07
PPVT I.Q.*	107.67	4-9	.50	105.47	4-9	.31	107.72	4-9	.50
Aud. Disc.	10.71	-	.02	11.06	-	.31	10.72	-	.03

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*Age score and S.D. taken from published test standardization data; the remaining age scores and S.D.'s were computed from local figures.

Posttest Differences for Boys.

Again, the Wilk's tests of overall significance showed p less than .001 for boys posttest which justified the rejection at this level of the null hypothesis of no differences among groups. The resulting univariate F test showed significant differences for nine dependent variables. Table B-2 gives the raw scores for the dependent variables (Beery, ITPA 4, ITPA 5, ITPA 8, ITPA L.Q., hopping-right foot, hopping-left foot, skipping, and total motor scores) for which differences were significant at p less than .05 together with appropriate t-tests.

E with Cn Posttest for Boys. The experimental boys with prekindergarten experience (E) scored significantly higher than the control boys with private nursery school experience (Cn) at >.05 to >.005 levels in seven of the nine variables (ITPA 4, ITPA 5, ITPA L.Q., hopping-right foot, hopping-left foot, skipping, and total motor score). The control boys (Cn) scored significantly higher than the experimental boys (E) only in ITPA 8.

E with Co Posttest for Boys. The experimental group (E) scored significantly higher than the control group with no school experience (Co) at >.01 to .005 levels in eight of the nine dependent variables. The exception was ITPA 8 which gave no significant difference between the groups.

Cn with Co Posttest for Boys. Between the two control groups (Cn and Co) significant differences favoring children with nursery school experience (Cn) at >.01 and >.025 levels were Beery and ITPA 8 respectively. Other differences were not significant.

Summary of Posttest Differences for Boys. The experimental boys (E) scored significantly higher than control boys (Cn) in seven dependent variables and higher than control boys (Co) in eight dependent variables identified by the Wilk's analysis. Only in ITPA 8 did Cn boys score significantly higher than E boys. The control group (Cn) scored significantly higher than control group (Co) in two dependent variables. The findings show considerably greater development of experimental boys (E) over control boys with and without private nursery school experience (Cn and Co) and slightly greater development of Cn over Co boys especially when compared with pretest results which showed no statistically significant differences among the three groups at the outset on any of the 17 variables.

Table B-2. Significance of Posttest Differences Among Experimental (E) and Control (Cn and Co) Groups for Boys

Dependent Variable	p Less Than	E with Cn				E with Co				Cn with Co			
		Posttest Mean		One-Sided t-Test	Significance	Posttest Mean		One-Sided t-Test	Significance	Posttest Mean		One-Sided t-Test	Significance
		E	Cn			E	Co			Cn	Co		
Beery	.019	8.16	8.28	- .27	ns	8.16	6.94	2.65	>.005	8.28	6.94	2.50	>.01
ITPA 4	.002	14.56	11.88	3.20	>.005	14.56	11.81	3.42	>.005	11.88	11.81	.08	ns
ITPA 5	.001	16.56	12.84	3.29	>.005	16.56	12.63	3.76	>.005	12.84	12.63	.20	ns
ITPA 8	.028	17.76	20.38	-1.76	>.05	17.76	16.63	.79	ns	20.38	16.63	2.25	>.025
ITPA L.Q.	.034	116.27	109.63	1.74	>.05	116.27	106.78	2.55	>.01	109.63	106.78	.72	ns
Hopping-Right	.002	2.31	1.41	3.77	>.005	2.31	1.69	2.61	>.005	1.41	1.69	- .99	ns
Hopping-Left	.029	2.09	1.44	2.82	>.005	2.09	1.44	2.42	>.01	1.44	1.44	.00	ns
Skipping	.001	2.07	.94	3.82	>.005	2.07	.81	4.49	>.005	.94	.81	.41	ns
Total Motor	.012	24.49	20.72	3.08	>.005	24.49	20.66	2.69	>.005	20.72	20.66	.04	ns

Posttest-Pretest Growth Differences for Boys.

In the MANOVA program (4), the Wilk's tests of overall significance showed p less than .004 for boys, thereby justifying the rejection at this level of the null hypothesis (upon which the analyses are based) that no differences among experimental (E) and control (Cn and Co) groups existed. The resulting univariate F test showed significant differences for four dependent variables. Table B-3 indicates the raw score differences for the dependent variables (ITPA 5, ITPA 6, ITPA L.Q., and skipping) for which the differences were significant at p less than .05. The groups between which significant differences were found by the univariate F tests are given in Table B-3.

E with Cn Growth for Boys. The posttest-pretest growth difference of the experimental boys with prekindergarten experience was significantly greater than growth of the control boys with nursery school experience in ITPA 5, ITPA 6, and skipping at >.05 to >.005 levels. No significant growth difference was found for ITPA total L.Q.

E with Co Growth for Boys. The experimental boys surpassed the control boys with no school experience significantly on all four dependent variables: ITPA 5, ITPA 6, ITPA Total L.Q., and skipping at >.025 to >.005 levels.

Cn with Co Growth for Boys. The control boys with nursery school experience failed to surpass the control boys with no school experience on any of the four dependent variables.

Summary of Growth Differences for Boys. Experimental boys (E) made significantly greater gains in skills development than control boys with and without nursery school experience (Cn and Co) in three of the four dependent variables. In ITPA L.Q., the E boys also scored significantly higher than Co boys but not higher than Cn boys. Cn boys did not surpass Co boys in any of the four dependent growth variables identified by the Wilk's tests of significance.

Table B-3. Significance of Posttest-Pretest Growth Differences Among Experimental (E) and Control (Cn and Co) Groups for Boys

Dependent Variable	P Less Than	E with Cn				E with Co				Cn with Co			
		Post-Pre Mean Difference		One-Sided t-Test	Sig-nifi-cance	Post-Pre Mean Difference		One-Sided t-Test	Sig-nifi-cance	Post-Pre Mean Difference		One-Sided t-Test	Sig-nifi-cance
		E	Cn			E	Co			Cn	Co		
ITPA 5	.008	5.00	3.13	1.71	> .05	5.00	1.69	3.18	>.005	3.13	1.69	1.39	ns
ITPA 6	.033	3.64	1.63	1.91	> .05	3.64	1.72	2.30	>.025	1.63	1.72	-0.09	ns
ITPA L.Q.	.018	9.20	4.34	1.48	ns	9.20	1.13	2.65	>.005	4.34	1.13	0.93	ns
Skipping	.002	1.38	.47	3.01	>.005	1.38	.41	3.61	>.005	.47	.41	0.23	ns

Pretest Differences for Girls.

In the MANOVA program (4), the Wilk's tests of overall significance also showed p less than .001 for girls, again justifying the rejection at this level of the null hypothesis (upon which the analyses are based) that no difference among experimental (E) and control (Cn and Co) girls existed. The resulting univariate F tests showed significant posttest differences among the girls but no significant pretest differences in any of the control or dependent variables. (See Appendix B-1.) Table B-4 gives pretest data on raw score, age score, and standard deviation (S.D.) from the mean for girls. Age score and S.D. figures were taken from publishers' manuals when available. Otherwise local data were computed.

Posttest Differences for Girls.

The Wilk's tests of overall significance showed p less than .001 for girls posttest which, again, justifies rejecting the null hypothesis of no differences among groups at this level. The resulting univariate F test showed significant differences for six dependent variables. The raw score differences for six dependent variables (Beery, ITPA 5, hopping-right foot, hopping-left foot, skipping, and total motor scores) for which differences were significant at p less than .05 together with appropriate t-tests as shown in Table 5.

E with Cn Posttest for Girls. Experimental girls (E) scored significantly higher than control girls (Cn) at $>.05$ to $>.01$ levels on five of the six dependent variables. Only the hopping-right foot score showed no significant difference.

E with Co Posttest for Girls. The experimental girls (E) scored significantly higher than control girls (Co) at $>.05$ to $>.005$ levels in all six dependent variables.

Cn with Co Posttest for Girls. No significant differences between the control groups were found on any of the six dependent variables.

Summary of Posttests for Girls. Experimental girls (E) scored significantly higher than control girls (Cn) in five of the six dependent variables; and scored significantly higher than control girls (Co) on all six dependent variables. No statistically significant differences were found between the control girls with or without private nursery school experience (Cn and Co) on any of the six dependent variables. The scores show considerably greater development of experimental girls (E) over control girls (Cn and Co) but no difference for girls between the two control groups. Again, these results should be interpreted in terms of pretest scores in which no statistically significant differences among the three groups were found on any of the 17 dependent variables.

Table B-4. Pretest Raw Score, Age Score, and Standard Deviation (S.D.) Data for Girls

Dependent Variable	Experiment (E)			Control (Cn)			Control (Co)		
	Mean Age: 4-5			Mean Age: 4-7			Mean Age: 4-6		
	Raw Score	Age Score	S.D.	Raw Score	Age Score	S.D.	Raw Score	Age Score	S.D.
Beery	5.76	4-3	-.23	5.51	4-3	-.66	5.91	4-4	-.32
ITPA 1*	16.91	5-0	.57	16.76	5-0	.57	17.71	5-2	.74
ITPA 2*	9.89	5-2	.42	8.83	4-9	.20	9.85	5-2	.42
ITPA 3*	12.33	4-8	.50	12.37	4-8	.50	12.97	4-11	.77
ITPA 4*	10.76	4-8	.25	10.59	4-8	.25	10.74	4-8	.25
ITPA 5*	10.62	4-9	.16	12.17	5-1	.44	11.24	4-9	.16
ITPA 6*	10.64	4-7	-.19	10.49	4-2	-.43	11.56	5-0	.04
ITPA 7*	8.62	5-0	.28	8.93	5-0	.28	8.68	5-0	.28
ITPA 8*	17.04	4-10	.37	16.63	4-10	.37	16.74	4-10	.37
ITPA 9*	8.24	4-4	-.13	8.32	4-4	-.13	9.12	4-7	.13
ITPA L.Q.*	107.44	4-9	.44	106.78	4-11	.44	109.50	4-11	.63
Hopping-Right	1.38	-	-.06	1.17	-	-.38	1.47	-	-.12
Hopping-Left	1.58	-	.24	1.39	-	-.37	1.44	-	-.33
Skipping	1.04	-	-.02	.95	-	-.31	1.15	-	-.16
Total Motor	18.76	-	-.14	17.88	-	-.44	19.82	-	-.09
PPVT I.Q.*	104.33	4-7	.25	106.93	4-11	.44	103.85	4-8	.25
Aud. Disc.	10.98	-	.00	11.10	-	.11	11.21	-	.22

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*Age score and S.D. taken from published test standardization data; the remaining age scores and S.D.'s were computed from local figures.

Table B-5. Significance of Posttest Differences Among Experimental (E) and Control (Cn and Co) Groups for Girls

Dependent Variable	p Less Than	E with Cn				E with Co				Cn with Co			
		Posttest Mean		One-Sided t-Test	Significance	Posttest Mean		One-Sided t-Test	Significance	Posttest Mean		One-Sided t-Test	Significance
		E	Cn			E	Co			Cn	Co		
Beery	.012	8.76	7.59	2.41	> .01	8.76	7.56	2.39	>.01	7.59	7.56	.05	ns
ITPA 5	.002	16.42	14.20	2.03	>.025	16.42	12.56	3.52	>.005	14.20	12.56	1.47	ns
Hopping-Right	.023	2.60	2.32	1.40	ns	2.60	2.03	2.39	>.01	2.32	2.03	1.09	ns
Hopping-Left	.009	2.60	2.05	2.51	> .01	2.60	2.00	2.45	>.01	2.05	2.00	.18	ns
Skipping	.001	2.64	2.22	1.84	> .05	2.64	1.79	3.39	>.005	2.22	1.79	1.43	ns
Total Motor	.025	26.49	23.59	2.48	>.01	26.49	23.91	1.87	>.05	23.59	23.91	-.21	ns

Posttest-Pretest Growth Differences for Girls.

In the MANOVA program (4), the Wilk's tests of overall significance showed p less than .001 for girls, thus justifying the rejection at this level of the null hypothesis (upon which the analyses are based) that no differences among experimental (E) and control (Cn and Co) groups existed. The resulting univariate F test showed significant differences for seven dependent variables. The raw score differences for seven dependent variables (Beery, ITPA 1, ITPA 5, ITPA L.Q., hopping-right foot, skipping, and total motor) for which differences are significant at p less than .05. The groups between which significant differences were found by the univariate F tests, are given in Table B-6.

E with Cn Growth for Girls. The posttest-pretest growth differences of the experimental girls with prekindergarten experience (E) were significantly greater than the control girls with nursery school experience (Cn) in only two dependent variables--Beery (>.05) and ITPA 5 (>.005). No significant differences were found for the other five variables.

E with Co Growth for Girls. The experimental girls (E) scored significantly higher than the control girls with no school experience (Co) on all seven dependent variables: Beery, ITPA 1, ITPA 5, ITPA L.Q., hopping-right foot, skipping, and total motor scores at >.005 level.

Cn with Co Growth for Girls. The control girls with nursery school experience (Cn) scored significantly higher than the control girls with no school experience (Co) on three dependent variables: ITPA L.Q., hopping-right foot, and skipping at >.025 to >.01 levels. No significant differences were found for Beery, ITPA 1, ITPA 5, or total motor scores.

Summary of Growth Differences for Girls. Experimental girls (E) made significantly greater gains than control girls with nursery school experience (Cn) in two of the seven dependent variables identified by the Wilk's formula. Experimental girls (E) made significantly greater gains than control girls with no school experience (Co) in all seven dependent variables.

Incidental to the present study, control girls with nursery school experience (Cn) made significantly greater gains than control girls with no school experience (Co) in three of the seven dependent variables identified by the Wilk's analysis.

In general, E girls gained more than Cn girls in two dependent growth variables and gained more than Co girls in all seven dependent growth variables. Cn girls surpassed Co girls in three dependent growth variables identified by the Wilk's tests of significance.

Table B-6. Significance of Posttest-Pretest Growth Differences Among Experimental (E) and Control (Cn and Co) Groups for Girls

Dependent Variable	p Less Than	E with Cn				E with Co				Cn with Co			
		Post-Pre Mean Difference		One-Sided t-Test	Sig-nifi-cance	Post-Pre Mean Difference		One-Sided t-Test	Sig-nifi-cance	Post-Pre Mean Difference		One-Sided t-Test	Sig-nifi-cance
		E	Cn			E	Co			Cn	Co		
Beery	.007	3.00	2.07	1.87	>.05	3.00	1.65	3.02	>.005	2.07	1.65	.86	ns
ITPA 1	.041	4.78	3.66	.93	ns	4.78	1.35	2.68	>.005	3.66	1.35	1.64	ns
ITPA 5	.001	5.80	2.02	3.65	>.005	5.80	1.32	3.95	>.005	2.02	1.32	.64	ns
ITPA L.Q.	.002	8.36	4.24	1.51	ns	8.36	-2.50	4.04	>.005	4.24	-2.50	2.34	>.01
Hopping-Right	.008	1.22	1.15	.29	ns	1.22	.56	2.73	>.005	1.15	.56	2.32	>.025
Skipping	.002	1.60	1.27	1.18	ns	1.60	.65	3.29	>.005	1.27	.65	2.02	>.025
Total Motor	.021	7.73	5.71	1.51	ns	7.73	4.09	2.65	>.005	5.71	4.09	1.16	ns

Summary of Growth Differences for the Total Group.

In general, nine of the 17 dependent growth variables appeared to be influenced significantly neither by participation in the prekindergarten program (E) nor by attendance at a private nursery school (Cn). These nine variables differed for boys and for girls. However, E boys surpassed Cn boys in three of four skill areas; E girls surpassed Cn girls in two of seven skill areas. The findings suggest greater effectiveness of the experimental prekindergarten program compared with the usual good nursery school.

Experimental boys (E) surpassed control boys with no school experience (Co) in all four skill areas; E girls surpassed Co girls in all seven skill areas. The effect of the experimental prekindergarten program over no school attendance is clearly evident.

Control boys with nursery school experience (Cn) surpassed control boys with no school experience (Co) in none of the four skill areas; Cn girls surpassed Co girls in three of the seven skill areas. These figures indicate the somewhat obvious interpretation that attendance at nursery school results in greater skill growth than not attending school.

The findings give partial support to the hypothesis that prekindergarten children in a skills developmental program will show greater growth in skills than children without this program.

Analyses similar to those reported in this appendix were made of data for boys and girls combined. This treatment did not provide significant differences among the experimental and control groups. The results of this combined treatment point to the important fact that, because boys and girls often differ in their level and degree of skills development, analyses of such data should be made separately by sex.

APPENDIX C

GROWTH IN DEVELOPMENTAL SKILLS IN FOUR EXPERIMENTAL CLASSES

Hypothesis.

Prekindergarten children who are provided with a personalized program based on individual assessment of their developmental skills and assigned to a class to meet their specific needs will grow in all skill areas but will show greater growth in the area of their specific need when compared with the other classes as measured by standardized tests after a period of six months.

Independent Variables.

Four developmental skills classes, organized to provide for the specific needs of children--motor (M), auditory including language (A), visual (V), and cognitive (C)--comprised the independent variables.

Control Variables.

The four classes were organized on the basis of assessment of children's skills development and no attention was given to control variables.

Dependent Variables.

Seventeen pretest and posttest measures of skills development were examined. They included Illinois Test of Psycholinguistic Abilities (ITPA) raw scores for subtests 1-9 and I.Q., Beery-Buktenica Developmental Form Sequence (Beery) raw score, three gross motor subtests and total raw scores, a three-dimensional auditory discrimination test raw score, and the Peabody Picture Vocabulary Test (PPVT) I.Q.

Analysis.

The statistical significance of mean score differences among the four experimental classes was computed for four control and 15 dependent variables on the pretest, and for 17 dependent variables on the posttest and posttest-pretest growth difference using the MANOVA program (4). (See Appendix B-1.)

Results.

The findings are reported for the pretest, the posttest, and the posttest-pretest growth differences separately for boys and girls.

Pretest Differences for Boys.

In the MANOVA program, the Wilk's tests of overall significance showed p less than .001 for boys, thereby justifying rejection at this level of the null hypothesis (upon which the analyses are based) that no differences among motor (M), auditory including language (A), visual (V), and cognitive (C) classes existed. The resulting univariate F tests showed significant differences among classes for 12 dependent variables. Table C-1 lists the variables for which differences were significant at p less than .05 together with appropriate t-tests.

Motor (M) with Auditory including Language (A) Pretest for Boys. M boys scored significantly higher than A boys at $>.05$ to $>.005$ levels in five of the 12 dependent variables (ITPA 1, ITPA 3, ITPA 5, ITPA L.Q., and auditory discrimination). A boys scored significantly higher than M boys in hopping-left foot and total motor score.

Motor (M) with Visual (V) Pretest for Boys. M boys did not surpass V boys on any of the 12 dependent variables. V boys scored significantly higher than M boys at $>.01$ to $>.005$ levels in four dependent variables (ITPA 3, ITPA 7, hopping-left foot, and total motor score).

Motor (M) with Cognitive (C) Pretest for Boys. M boys did not surpass C boys on any of the 12 dependent variables. C boys scored significantly higher than M boys at $>.05$ to $>.005$ levels in ten dependent variables (Beery, ITPA 1, ITPA 3, ITPA 7, ITPA 8, ITPA 9, ITPA L.Q., hopping-left foot, total motor, and PPVT I.Q.).

Auditory including Language (A) with Visual (V) Pretest for Boys. A boys did not surpass V boys on any of the 12 dependent variables. V boys scored significantly higher than A boys at $>.05$ to $>.005$ levels in eight dependent variables (ITPA 1, ITPA 3, ITPA 5, ITPA 7, ITPA 8, ITPA L.Q., PPVT I.Q., and auditory discrimination).

Auditory including Language (A) with Cognitive (C) Pretest for Boys. A boys did not surpass C boys on any of the 12 dependent variables. C boys scored significantly higher than A boys at $>.01$ to $>.005$ levels on ten dependent variables (Beery, ITPA 1, ITPA 3, ITPA 5, ITPA 7, ITPA 8, ITPA 9, ITPA L.Q., PPVT I.Q., and auditory discrimination).

Visual (V) with Cognitive (C) Pretest for Boys. V boys did not surpass C boys on any of the 12 dependent variables. C boys scored significantly higher than V boys at $>.05$ to $>.005$ levels in three dependent variables (Beery, ITPA 8, and ITPA 9).

Summary of Pretest Differences for Boys. Children in motor (M), auditory including language (A), visual (V), and cognitive (C) classes were compared on pretest mean raw scores which were significant among the classes for 12 dependent variables. M boys surpassed A boys in five skill areas. A boys surpassed M boys in two skill areas. V boys surpassed M boys in four skill areas and A boys in eight skill areas. C boys surpassed M boys in ten skill areas, A boys in ten skill areas, and V boys in three skill areas. Among the four classes, the number of significant pretest scores of boys from high to low were: cognitive--23, visual--12, motor--5, and auditory including language--2.

Table C-1. Significance of Pretest Differences for Boys Among Motor (M), Auditory including Language (A), Visual (V), and Cognitive (C) Classes

Dependent Variable	p Less Than	Motor with Auditory				Motor with Visual				Motor with Cognitive			
		Pretest Mean		One-Sided t-Test	Sig-nifi-cance	Pretest Mean		One-Sided t-Test	Sig-nifi-cance	Pretest Mean		One-Sided t-Test	Sig-nifi-cance
		M	A			M	V			M	C		
Beery	.027	5.00	5.17	- .18	ns	5.00	4.45	.58	ns	5.00	7.09	-2.22	>.025
ITPA 1	.005	16.45	13.00	1.79	>.05	16.45	18.82	- .92	ns	16.45	20.64	-2.23	>.025
ITPA 3	.001	10.36	8.00	1.92	>.05	10.36	14.82	-2.70	>.01	10.36	16.00	-3.92	>.005
ITPA 5	.001	11.64	7.58	2.88	>.005	11.64	13.82	-1.31	ns	11.64	13.55	-1.17	ns
ITPA 7	.001	6.73	6.42	.21	ns	6.73	11.18	-3.19	>.005	6.73	11.91	-4.60	>.005
ITPA 8	.002	14.91	12.67	1.09	ns	14.91	17.27	- .93	ns	14.91	22.36	-3.67	>.005
ITPA 9	.007	6.73	6.42	.23	ns	6.73	8.18	-1.28	ns	6.73	10.09	-3.44	>.005
ITPA L.Q.	.001	107.27	91.83	2.97	>.005	107.27	111.18	- .59	ns	107.27	119.36	-2.20	>.025
Hopping-Left	.003	.64	1.92	-3.57	>.005	.64	1.91	-3.39	>.005	.64	1.36	-2.29	>.025
Total Motor	.001	10.45	19.92	-6.04	>.005	10.45	20.27	-4.96	>.005	10.45	18.82	-6.53	>.005
PPVT I.Q.	.003	105.00	97.33	1.22	ns	105.00	112.18	-1.10	ns	105.00	117.09	-1.98	>.05
Aud.-Disc.	.001	11.00	9.50	2.86	>.005	11.00	11.09	- .21	ns	11.00	11.36	- .88	ns

Table C-1. (continued)

Dependent Variable	p Less Than	Auditory with Visual				Auditory with Cognitive				Visual with Cognitive			
		Pretest Mean		One-Sided t-Test	Sig-nifi-cance	Pretest Mean		One-Sided t-Test	Sig-nifi-cance	Pretest Mean		One-Sided t-Test	Sig-nifi-cance
		A	V			A	C			V	C		
Beery	.027	5.17	4.45	.97	ns	5.17	7.09	-2.62	>.01	4.45	7.09	-3.52	>.005
ITPA 1	.005	13.00	18.82	-2.11	>.025	13.00	20.64	-3.49	>.005	18.82	20.64	- .65	ns
ITPA 3	.001	8.00	14.82	-5.09	>.005	8.00	16.00	-7.31	>.005	14.82	16.00	- .76	ns
ITPA 5	.001	7.58	13.82	-4.32	>.005	7.58	13.55	-4.24	>.005	13.82	13.55	.16	ns
ITPA 7	.001	6.42	11.18	-3.21	>.005	6.42	11.91	-4.37	>.005	11.18	11.91	- .62	ns
ITPA 8	.002	12.67	17.27	-1.98	>.05	12.67	22.36	-5.30	>.005	17.27	22.36	-2.18	>.025
ITPA 9	.007	6.42	8.18	-1.31	ns	6.42	10.09	-3.00	>.005	8.18	10.09	-1.83	>.05
ITPA L.Q.	.001	91.83	111.18	-3.18	>.005	91.83	119.36	-5.58	>.005	111.18	119.36	-1.28	ns
Hopping Left	.003	1.92	1.91	.01	ns	1.92	1.36	1.65	ns	1.91	1.36	1.55	ns
Total Motor	.001	19.92	20.27	- .15	ns	19.92	18.82	.62	ns	20.27	18.82	.67	ns
PPVT I.Q.	.003	97.33	112.18	-2.50	>.025	97.33	117.09	-3.59	>.005	112.18	117.09	- .86	ns
Aud.-Disc.	.001	9.50	11.09	-3.30	>.005	9.50	11.36	-3.89	>.005	11.09	11.36	- .77	ns

Posttest Differences for Boys.

Again, the Wilk's tests of overall significance showed p less than .001 for boys posttest which justified the rejection at this level of the null hypothesis of no differences among the classes. The resulting univariate F tests showed significant differences among classes for nine dependent variables. Table C-2 lists the variables (Beery, ITPA 3, ITPA 5, ITPA 7, ITPA 8, ITPA 9, ITPA L.Q., skipping, and PPVT I.Q.) for which differences were found at p less than .05 together with appropriate t-tests.

Motor (M) with Auditory including Language (A) Posttest for Boys. M boys scored significantly higher than A boys at $>.025$ to $>.005$ levels in three of the nine dependent variables (ITPA 7, ITPA L.Q., and PPVT I.Q.). A boys did not surpass M boys on any of the dependent variables.

Motor (M) with Visual (V) Posttest for Boys. M boys did not surpass V boys on any of the nine dependent variables. V boys scored significantly higher than M boys at $>.05$ to $>.005$ levels in four dependent variables (ITPA 3, ITPA 5, ITPA 7, and skipping).

Motor (M) with Cognitive (C) Posttest for Boys. M boys did not surpass C boys on any of the nine dependent variables. C boys scored significantly higher than M boys at $>.05$ to $>.005$ levels in eight dependent variables (Beery, ITPA 3, ITPA 5, ITPA 7, ITPA 8, ITPA 9, ITPA L.Q., and skipping).

Auditory including Language (A) with Visual (V) Posttest for Boys. A boys did not surpass V boys on any of the nine dependent variables. V boys scored significantly higher than A boys at $>.025$ to $>.005$ levels on seven variables (ITPA 3, ITPA 5, ITPA 7, ITPA 8, ITPA L.Q., skipping, and PPVT I.Q.).

Auditory including Language (A) with Cognitive (C) Posttest for Boys. A boys did not surpass C boys on any of the nine dependent variables. C boys scored significantly higher than A boys at $>.05$ to $>.005$ levels on all nine dependent variables (Beery, ITPA 3, ITPA 5, ITPA 7, ITPA 8, ITPA 9, ITPA L.Q., skipping, and PPVT I.Q.).

Visual (V) with Cognitive (C) Posttest for Boys. V boys did not surpass C boys on any of the nine dependent variables. C boys scored significantly higher than V boys at $>.05$ to $>.005$ levels on three dependent variables (Beery, ITPA 3, and ITPA 9).

Summary of Posttest Differences for Boys. Children in motor (M), auditory including language (A), visual (V), and cognitive (C) classes were compared on posttest mean raw scores which were significant among the classes for nine dependent variables. M boys surpassed A boys in three skill areas. A boys did not surpass M, V, or C boys in any skill area. V boys surpassed M boys in four skill areas and A boys in seven skill areas. C boys surpassed M boys in eight skill areas, A boys in all nine skill areas, and V boys in three skill areas. Among the four classes, the number of significant posttest scores of boys from high to low were: cognitive--20, visual--11, motor--3, and auditory including language--0. Although all boys showed considerable growth, the classes retained the same relative positions indicated on the pretest.

Table C-2. Significance of Posttest Differences for Boys Among Motor (M), Auditory including Language (A), Visual (V), and Cognitive (C) Classes

Dependent Variable	P Less Than	Motor with Auditory				Motor with Visual				Motor with Cognitive			
		Posttest Mean		One-Sided t-Test	Sig-nifi-cance	Posttest Mean		One-Sided t-Test	Sig-nifi-cance	Posttest Mean		One-Sided t-Test	Sig-nifi-cance
		M	A			M	V			M	C		
Beery	.008	7.45	7.42	.06	ns	7.45	8.18	-1.14	ns	7.45	9.64	-3.47	>.005
ITPA 3	.001	15.45	14.17	.82	ns	15.45	17.91	-1.84	>.05	15.45	19.45	-3.57	>.005
ITPA 5	.008	13.82	14.50	- .40	ns	13.82	19.64	-3.17	>.005	13.82	18.45	-2.80	>.01
ITPA 7	.001	10.73	8.58	2.17	>.025	10.73	13.55	-2.60	>.01	10.73	12.73	-2.40	>.025
ITPA 8	.028	16.45	14.42	.83	ns	16.45	19.55	-1.14	ns	16.45	20.91	-1.73	>.05
ITPA 9	.001	11.36	9.83	1.15	ns	11.36	10.18	1.00	ns	11.36	13.73	-1.87	>.05
ITPA L.Q.	.001	116.91	100.08	2.92	>.005	116.91	122.91	-1.30	ns	116.91	126.64	-2.12	>.025
Skipping	.002	1.73	1.33	.67	ns	1.73	2.64	-1.99	>.05	1.73	2.64	-1.99	>.05
PPVT I.Q.	.001	118.00	106.25	3.10	>.005	118.00	121.36	- .80	ns	118.00	119.45	- .28	ns

Table C-2. (continued)

Dependent Variable	P Less Than	Auditory with Visual				Auditory with Cognitive				Visual with Cognitive			
		Posttest Mean		One-Sided t-Test	Sig-nifi-cance	Posttest Mean		One-Sided t-Test	Sig-nifi-cance	Posttest Mean		One-Sided t-Test	Sig-nifi-cance
		A	V			A	C			V	C		
Beery	.008	7.42	8.18	-1.15	ns	7.42	9.64	-3.39	>.005	8.18	9.64	-2.15	>.025
ITPA 3	.001	14.17	17.91	-2.64	>.01	14.17	19.45	-4.29	>.005	17.91	19.45	-1.73	>.05
ITPA 5	.008	14.50	19.64	-2.49	>.025	14.50	18.45	-2.06	>.05	19.64	18.45	.57	ns
ITPA 7	.001	8.58	13.55	-4.57	>.005	8.58	12.73	-4.81	>.005	13.55	12.73	.85	ns
ITPA 8	.028	14.42	19.55	-2.84	>.005	14.42	20.91	-3.99	>.005	19.55	20.91	- .71	ns
ITPA 9	.001	9.83	10.18	- .36	ns	9.83	13.73	-3.69	>.005	10.18	13.73	-4.32	>.005
ITPA L.Q.	.001	100.08	122.91	-3.49	>.005	100.08	126.64	-4.07	>.005	122.91	126.64	- .66	ns
Skipping	.002	1.33	2.64	-2.56	>.01	1.33	2.64	-2.56	>.01	2.64	2.64	- .00	ns
PPVT I.Q.	.001	106.25	121.36	-4.90	>.005	106.25	119.45	-3.13	>.005	121.36	119.45	.41	ns

Posttest-Pretest Growth Differences for Boys.

In the MANOVA program (4), the Wilk's tests of overall significance showed p less than .019 for boys, thereby justifying the rejection at this level of the null hypothesis (upon which the analyses are based) that no differences among the four classes existed. The resulting univariate F tests showed significant differences for four of the 17 dependent variables. Table C-3 indicates the dependent variables (ITPA 2, ITPA 3, total motor, and auditory discrimination) for which differences were found at p less than .05 together with appropriate t-tests.

Motor (M) with Auditory including Language (A) Growth for Boys. M boys grew significantly more than A boys at $>.005$ level in one of the four dependent variables, total motor score. A boys grew significantly more than M boys at $>.05$ level in auditory discrimination.

Motor (M) with Visual (V) Growth for Boys. Again, M boys grew significantly more than V boys at $>.05$ level in one dependent variable, total motor score. V boys did not surpass the M boys in growth in any of the four dependent variables.

Motor (M) with Cognitive (C) Growth for Boys. Still again, M boys grew significantly more than C boys at $>.025$ level in total motor score. C boys did not surpass M boys in growth in any of the four dependent variables.

Auditory including Language (A) with Visual (V) Growth for Boys. A boys grew significantly more than V boys at $>.05$ level in ITPA 3. V boys did not surpass A boys in growth in any of the four dependent variables.

Auditory including Language (A) with Cognitive (C) Growth for Boys. Again, A boys grew significantly more than C boys at $>.05$ level in ITPA 3 and at $>.025$ level in auditory discrimination. C boys did not surpass A boys in growth in any of the four dependent variables.

Visual (V) with Cognitive (C) Growth for Boys. V boys grew significantly more than C boys at $>.005$ level in ITPA 2. C boys did not surpass V boys in growth in any of the four dependent variables.

Summary of Posttest-Pretest Growth Differences for Boys. Children in motor (M), auditory including language (A), visual (V), and cognitive (C) classes were compared on posttest-pretest growth differences which were significant among the classes for four dependent variables. M boys surpassed A, V, and C boys in growth in one skill area (total motor score). A boys surpassed M boys in growth in one skill area (auditory discrimination) and V boys in one skill area (ITPA 3-Auditory-Vocal Association), C boys in two skill areas (ITPA 3 and auditory discrimination). V boys surpassed C boys in growth in one skill area (ITPA 2-Visual Decoding). C boys, whose skills were intact from the outset did not surpass M, A, or V boys in growth in posttest-pretest growth difference in any skill area. In each of the three classes organized to strengthen weaknesses (M, A, and V), the significant posttest-pretest growth difference of boys occurred in areas of greatest weakness in the pretest. In the cognitive class, C boys, with basic skills intact, did not excel in amount of growth compared with boys in the other classes.

The findings give partial support to the hypothesis that prekindergarten children in a skills development program will grow in all skills areas but will show greater growth in the area of their specific need.

Table C-3. Significance of Posttest-Pretest Growth Differences for Boys among Motor (M), Auditory including Language (A), Visual (V), and Cognitive (C) Classes

Dependent Variable	p Less Than	Motor with Auditory				Motor with Visual				Motor with Cognitive			
		Post-Pre Mean Difference		One-Sided t-Test	Sig-nifi-cance	Post-Pre Mean Difference		One-Sided t-Test	Sig-nifi-cance	Post-Pre Mean Difference		One-Sided t-Test	Sig-nifi-cance
		M	A			M	V			M	C		
ITPA 2	.045	3.27	3.08	.11	ns	3.27	5.45	-1.52	ns	3.27	1.00	1.47	ns
ITPA 3	.039	5.09	6.17	- .70	ns	5.09	3.09	1.36	ns	5.09	3.45	1.22	ns
Total Motor	.015	11.36	4.33	2.93	.005	11.36	6.73	1.81	.05	11.36	6.09	2.27	.025
Aud.-Disc.	.029	.55	1.83	-1.91	.05	.55	.91	- .70	ns	.55	.36	.32	ns

Dependent Variable	p Less Than	Auditory with Visual				Auditory with Cognitive				Visual with Cognitive			
		Post-Pre Mean Difference		One-Sided t-Test	Sig-nifi-cance	Post-Pre Mean Difference		One-Sided t-Test	Sig-nifi-cance	Post-Pre Mean Difference		One-Sided t-Test	Sig-nifi-cance
		A	V			A	C			V	C		
ITPA 2	.045	3.08	5.45	-1.60	ns	3.08	1.00	1.32	ns	5.45	1.00	3.14	.005
ITPA 3	.039	6.17	3.09	2.04	.05	6.17	3.45	1.96	.05	3.09	3.45	- .27	ns
Total Motor	.015	4.33	6.73	-1.11	ns	4.33	6.09	- .92	ns	6.73	6.09	.31	ns
Aud.-Disc.	.029	1.83	.91	1.63	ns	1.83	.36	2.42	.025	.91	.36	1.29	ns

Pretest Differences for Girls.

In the MANOVA program (4), the Wilk's tests of overall significance showed p less than .001 for girls (identical with boys), again justifying rejection at this level of the null hypothesis of no differences among classes. The resulting univariate F tests showed significant differences for 14 dependent variables. Table C-4 lists the control and dependent variables (Age, ITPA 1, ITPA 2, ITPA 3, ITPA 5, ITPA 6, ITPA 7, ITPA 8, ITPA 9, ITPA L.Q., hopping-right foot, hopping-left foot, skipping, and total motor) for which differences were significant at p less than .05 together with appropriate t-tests.

Motor (M) with Auditory including Language (A) Pretest for Girls. M girls did not surpass A girls on any of the 14 variables. A girls scored significantly higher than M girls at $>.05$ to $>.005$ levels in six dependent variables (age, ITPA 6, hopping-right foot, hopping-left foot, skipping, and total motor scores).

Motor (M) with Visual (V) Pretest for Girls. M girls scored significantly higher than V girls at $>.05$ level in one area, ITPA 2. V girls scored significantly higher than M girls at $>.05$ to $>.005$ levels in 12 of the 14 variables (age, ITPA 1, ITPA 3, ITPA 5, ITPA 7, ITPA 8, ITPA 9, ITPA L.Q., hopping-right foot, hopping-left foot, skipping, and total motor scores).

Motor (M) with Cognitive (C) Pretest for Girls. M girls did not surpass C girls in any of the 14 variables. C girls scored significantly higher than M girls at $>.025$ to $>.005$ levels in 12 variables (age, ITPA 1, ITPA 2, ITPA 3, ITPA 7, ITPA 8, ITPA 9, ITPA L.Q., hopping-right foot, hopping-left foot, skipping, and total motor scores).

Auditory including Language (A) with Visual (V) Pretest for Girls. A girls scored significantly higher than V girls at $>.005$ level in one area, ITPA 2. V girls scored significantly higher than A girls at $>.025$ to $>.005$ levels on three of the 14 variables (ITPA 3, ITPA 7, and ITPA L.Q.).

Auditory including Language (A) with Cognitive (C) Pretest for Girls. A girls scored significantly higher than C girls at $>.025$ level in one area, ITPA 6. C girls scored significantly higher than A girls at $>.025$ to $>.005$ levels on six variables (ITPA 1, ITPA 2, ITPA 3, ITPA 7, ITPA 9, and ITPA L.Q.).

Visual (V) with Cognitive (C) Pretest for Girls. V girls scored significantly higher than C girls at $>.05$ level on ITPA 6. C girls scored significantly higher than V girls at $>.05$ or $>.005$ levels in two areas (ITPA 2 and ITPA 9).

Summary of Pretest Differences for Girls. Children in the motor (M), auditory including language (A), visual (V), and cognitive (C) classes were compared on pretest mean raw scores which were significant among the classes for 14 dependent variables. M girls surpassed V girls in one skill area. A girls surpassed M girls in six skill areas, V girls in one skill area, and C girls in one skill area. V girls surpassed M girls in 12 skill areas, A girls in three skill areas, and C girls in one skill area. C girls surpassed M girls in 12 skill areas, A girls in six skill areas, and V girls in two skill areas. Among the four classes, the number of significant pretest scores of girls from high to low: cognitive--20, visual--16, auditory including language--8, and motor--1.

Table C-4. Significance of Pretest Differences for Girls among Motor (M), Auditory including Language (A), Visual (V), and Cognitive (C) Classes

Dependent Variable	P Less Than	Motor with Auditory				Motor with Visual				Motor with Cognitive			
		Pretest Mean		One-Sided t-Test	Sig-nifi-cance	Pretest Mean		One-Sided t-Test	Sig-nifi-cance	Pretest Mean		One-Sided t-Test	Sig-nifi-cance
		M	A			M	V			M	C		
Age	.005	49.80	54.73	-3.84	>.005	49.80	54.00	-2.79	>.01	49.80	54.00	-2.64	>.01
ITPA 1	.009	13.00	15.18	-1.20	ns	13.00	18.50	-2.07	>.05	13.00	19.93	-3.45	>.005
ITPA 2	.001	9.10	10.27	-1.02	ns	9.10	7.00	1.94	>.05	9.10	12.21	-3.03	>.005
ITPA 3	.001	9.40	10.91	-1.05	ns	9.40	13.90	-3.10	>.005	9.40	14.43	-3.77	>.005
ITPA 5	.036	8.20	10.45	-1.32	ns	8.20	13.30	-3.15	>.005	8.20	10.57	-1.61	ns
ITPA 6	.037	8.60	12.45	-1.95	>.05	8.60	12.00	-1.69	ns	8.60	9.71	- .81	ns
ITPA 7	.001	6.50	6.45	- .04	ns	6.50	9.90	-3.37	>.005	6.50	10.93	-4.16	>.005
ITPA 8	.006	11.70	16.00	-1.65	ns	11.70	19.80	-2.41	>.025	11.70	19.71	-2.53	>.01
ITPA 9	.001	5.80	7.27	-1.11	ns	5.80	8.60	-2.14	>.025	5.80	10.50	-3.83	>.005
ITPA L.Q.	.001	98.60	96.91	.26	ns	98.60	116.00	-2.48	>.025	98.60	115.93	-2.99	>.005
Hopping-Right	.011	.50	1.82	-2.79	>.01	.50	1.80	-3.07	>.005	.50	1.36	-2.18	>.025
Hopping-Left	.001	.50	1.73	-3.43	>.005	.50	2.00	-3.50	>.005	.50	1.93	-3.87	>.005
Skipping	.004	.10	.91	-2.17	>.025	.10	1.80	-3.97	>.005	.10	1.29	-2.64	>.01
Total Motor	.001	11.90	20.73	-4.57	>.005	11.90	20.80	-3.94	>.005	11.90	20.64	-3.87	>.005

Table C-4. (continued)

Dependent Variable	p Less Than	Auditory with Visual				Auditory with Cognitive				Visual with Cognitive			
		Pretest Mean		One-Sided t-Test	Significance	Pretest Mean		One-Sided t-Test	Significance	Pretest Mean		One-Sided t-Test	Significance
		A	V			A	C			V	C		
Age	.005	54.73	54.00	.57	ns	54.73	54.00	.51	ns	54.00	54.00	.00	ns
ITPA 1	.009	15.18	18.50	-1.59	ns	15.18	19.93	-3.21	>.005	18.50	19.93	- .65	ns
ITPA 2	.001	10.27	7.00	3.84	>.005	10.27	12.21	-2.28	>.025	7.00	12.21	-6.67	>.005
ITPA 3	.001	10.91	13.90	-2.33	>.025	10.91	14.43	-2.94	>.005	13.90	14.43	- .43	ns
ITPA 5	.036	10.45	13.30	-1.45	ns	10.45	10.57	- .06	ns	13.30	10.57	1.59	ns
ITPA 6	.037	12.45	12.00	.24	ns	12.45	9.71	2.26	>.025	12.00	9.71	1.90	>.05
ITPA 7	.001	6.45	9.90	-3.59	>.005	6.45	10.93	-4.41	>.005	9.90	10.93	- .99	ns
ITPA 8	.006	16.00	19.80	-1.63	ns	16.00	19.71	-1.55	ns	19.80	19.71	.02	ns
ITPA 9	.001	7.27	8.60	-1.34	ns	7.27	10.50	-3.29	>.005	8.60	10.50	-1.99	>.05
ITPA L.Q.	.001	96.91	116.00	-3.03	>.005	96.91	115.93	-3.66	>.005	116.00	115.93	- .01	ns
Hopping-Right	.011	1.82	1.80	.03	ns	1.82	1.36	.95	ns	1.80	1.36	.96	ns
Hopping-Left	.001	1.73	2.00	- .60	ns	1.73	1.93	- .52	ns	2.00	1.93	.16	ns
Skipping	.004	.91	1.80	-1.66	ns	.91	1.29	- .72	ns	1.80	1.29	.91	ns
Total Motor	.001	20.73	20.80	- .03	ns	20.73	20.64	.03	ns	20.80	20.64	.06	ns

Posttest Differences for Girls.

In the MANOVA program (4), the Wilk's tests of overall significance showed p less than .001 for girls, thereby justifying the rejection at this level of the null hypothesis (upon which the analyses are based) that no difference among the four classes existed. The resulting univariate F tests showed significant differences for three of the 17 dependent variables. Table C-5 lists the variables (Beery, ITPA 3, and ITPA 7) for which differences were found at p less than .05 together with appropriate t-tests.

Motor (M) with Auditory including Language (A) Posttest for Girls. No significant differences were found.

Motor (M) with Visual (V) Posttest for Girls. V girls scored significantly higher than M girls at $>.05$ to $>.005$ levels on all three dependent variables (Beery, ITPA 3, and ITPA 7).

Motor (M) with Cognitive (C) Posttest for Girls. C girls scored significantly higher than M girls at $>.025$ to $>.005$ level on all three dependent variables (Beery, ITPA 3, and ITPA 7).

Auditory including Language (A) with Visual (V) Posttest for Girls. V girls scored significantly higher than A girls at $>.025$ on Beery.

Auditory including Language (A) with Cognitive (C) Posttest for Girls. C girls scored significantly higher than A girls at $>.05$ to $>.025$ levels on all three dependent variables (Beery, ITPA 3, and ITPA 7).

Visual (V) with Cognitive (C) Posttest for Girls. No significant differences were found.

Summary of Posttest Differences for Girls. Children in the motor (M), auditory including language (A), visual (V), and cognitive (C) classes were compared on posttest mean raw scores which were significant among the classes for three dependent variables. M girls did not surpass A, V, or C girls in any skill area. Likewise, A girls did not surpass M, V, or C girls in any skill area. V girls surpassed M girls in all three skill areas, A girls in one skill area. C girls surpassed M and A girls in all three skill areas. Among the four classes, the number of significant posttest scores for girls from high to low were: cognitive--6 and visual--4. Auditory including language and motor classes did not surpass the other two classes significantly on posttest scores. Although all girls showed considerable growth, the C and V classes retained their highest and next highest positions, respectively, and the A and M classes tied for the lowest position.

Table C-5. Significance of Posttest Differences for Girls among Motor (M), Auditory including Language (A), Visual (V), and Cognitive (C) Classes

Dependent Variable	p Less Than	Motor with Auditory				Motor with Visual				Motor with Cognitive			
		Posttest Mean		One-Sided t-Test	Sig-nifi-cance	Posttest Mean		One-Sided t-Test	Sig-nifi-cance	Posttest Mean		One-Sided t-Test	Sig-nifi-cance
		M	A			M	V			M	C		
Beery	.006	7.70	7.91	- .27	ns	7.70	9.90	-3.04	>.005	7.70	9.36	-2.39	>.025
ITPA 3	.046	15.10	16.73	-1.42	ns	15.10	17.40	-1.87	>.05	15.10	18.29	-3.24	>.005
ITPA 7	.001	9.50	10.91	-1.08	ns	9.50	12.30	-2.39	>.025	9.50	13.71	-4.40	>.005

Dependent Variable	p Less Than	Auditory with Visual				Auditory with Cognitive				Visual with Cognitive			
		Posttest Mean		One-Sided t-Test	Sig-nifi-cance	Posttest Mean		One-Sided t-Test	Sig-nifi-cance	Posttest Mean		One-Sided t-Test	Sig-nifi-cance
		A	V			A	C			V	C		
Beery	.006	7.91	9.90	-2.25	>.025	7.91	9.36	-1.79	>.05	9.90	9.36	.68	ns
ITPA 3	.046	16.73	17.40	- .61	ns	16.73	18.29	-1.79	>.05	17.40	18.29	- .94	ns
ITPA 7	.001	10.91	12.30	-1.00	ns	10.91	13.71	-2.46	>.025	12.30	13.71	-1.35	ns

Posttest-Pretest Growth Differences for Girls.

In the MANOVA program (4), the Wilk's tests of overall significance showed p less than .001 for girls, thus justifying the rejection at this level of the null hypothesis of no differences among the four classes. The resulting univariate F tests showed significant differences for three of the 17 dependent variables. Table C-6 indicates the dependent variables (ITPA 2, ITPA 9, and total motor scores) for which differences were found at p less than .05 together with appropriate t-tests.

Motor (M) with Auditory including Language (A) Growth for Girls. M girls grew significantly more than A girls at >.005 level in total motor score. A girls did not surpass M girls in growth in any of the three dependent variables.

Motor (M) with Visual (V) Growth for Girls. M girls grew significantly more than V girls at >.005 level in total motor score. V girls grew significantly higher than M girls at >.05 level in ITPA 2.

Motor (M) with Cognitive (C) Growth for Girls. M girls grew significantly more than C girls at >.05 to >.005 levels in all three dependent variables (ITPA 2, ITPA 9, and total motor score).

Auditory including Language (A) with Visual (V) Growth for Girls. A girls did not surpass V girls in growth in any of the three dependent variables. V girls grew significantly more than A girls at >.025 in ITPA 2.

Auditory including Language (A) with Cognitive (C) Growth for Girls. A girls grew significantly more than C girls at >.025 to .005 levels in two dependent variables, ITPA 2 and ITPA 9. C girls did not surpass A girls in any skill growth.

Visual (V) with Cognitive (C) Growth for Girls. V girls grew significantly more than C girls at >.05 to >.005 levels in all three dependent variables (ITPA 2, ITPA 9, and total motor score).

Summary of Posttest-Pretest Growth Differences for Girls. Children in the motor (M), auditory including language (A), visual (V), and cognitive (C) classes were compared on posttest-pretest growth differences which were significant among the classes for three dependent variables. M girls surpassed A and V girls in one skill area (total motor score) and surpassed C girls in all three skill areas (ITPA 2, Visual-Decoding; ITPA 9, Visual Motor Sequencing; and total motor score). A girls surpassed C girls in two skill areas (ITPA 2 and ITPA 9). V girls surpassed M and A girls in one variable (ITPA 2) and C girls in three variables (ITPA 2, ITPA 9, and total motor score). C girls whose skills were intact from the outset did not surpass M, V, or A girls in amount of growth in any skill area. In each of the three classes programmed to strengthen weaknesses (M, A, and V), the significant posttest-pretest growth difference for girls occurred in areas of greatest weakness in the pretest. In the cognitive class, C girls, with skills intact, did not excel in amount of growth compared with girls in the other classes.

The findings give partial support to the hypothesis that prekindergarten children in a skills development program will grow in all skills areas but will show greater growth in the area of their specific need.

Table C-6. Significance of Posttest-Pretest Growth Differences for Girls Among Motor (M), Auditory including Language (A), Visual (V), and Cognitive (C) Classes

Dependent Variable	P Less Than	Motor with Auditory				Motor with Visual				Motor with Cognitive			
		Pre-Post Mean Difference		One-Sided t-Test	Sig-nifi-cance	Pre-Post Mean Difference		One-Sided t-Test	Sig-nifi-cance	Pre-Post Mean Difference		One-Sided t-Test	Sig-nifi-cance
		M	A			M	V			M	C		
ITPA 2	.001	1.20	1.18	.01	ns	1.20	5.00	-2.06	>.05	1.20	-1.71	2.00	>.05
ITPA 9	.006	5.90	4.27	.94	ns	5.90	3.70	1.29	ns	5.90	.93	3.53	>.005
Total Motor	.001	13.90	6.27	3.75	>.005	13.90	8.20	3.06	>.005	13.90	4.14	4.63	>.005

Dependent Variable	P Less Than	Auditory with Visual				Auditory with Cognitive				Visual with Cognitive			
		Pre-Post Mean Difference		One-Sided t-Test	Sig-nifi-cance	Pre-Post Mean Difference		One-Sided t-Test	Sig-nifi-cance	Pre-Post Mean Difference		One-Sided t-Test	Sig-nifi-cance
		A	V			A	C			V	C		
ITPA 2	.001	1.18	5.00	-2.31	>.025	1.18	-1.71	2.22	>.025	5.00	-1.71	4.50	>.005
ITPA 9	.006	4.27	3.70	.45	ns	4.27	.93	3.25	>.005	3.70	.93	2.97	>.005
Total Motor	.001	6.27	8.20	- .82	ns	6.27	4.14	.89	ns	8.20	4.14	1.74	>.05

APPENDIX D

GROWTH IN SPECIFIC DEVELOPMENTAL SKILLS BY CLASS AND BY CONTROL GROUPS; GROWTH IN COGNITION AND EXPRESSION FOR THE EXPERIMENTAL CLASSES, THE COMBINED EXPERIMENTAL GROUP, AND THE CONTROL GROUPS

Hypothesis.

Prekindergarten children who are provided with a personalized program based on individual assessment will show greater growth in the area of specific programming as well as in the cognitive process and the expressive process compared with children not participating in a developmental skills program.

Independent Variables.

Four developmental skills classes were organized to provide for children's specific needs in the following five areas; motor (M), auditory and language (A), visual (V), cognitive (C). The four classes comprised the experimental group (E). The subjects of the study also included two control groups, one having nursery school experience (Cn) and one with no school experience (Co). Participation or non-participation in the developmental skills classes constituted the independent variable.

Control Variables.

The significances of difference in age, sex, Illinois Test of Psycholinguistic Abilities (ITPA) L.Q., and Peabody Picture Vocabulary Test (PPVT) I.Q. pretests of matched children in the experimental and control groups (E, Cn, Co) were computed. The four classes (Em, Ea, Ev, Ec) were not matched with each other or with the control groups.

Dependent Variables.

Skills development was assessed by 17 pretest and posttest measures to ascertain the levels of functioning in the five developmental skills areas after a period of six months.

Analysis.

The statistical significance of posttest-pretest mean score differences was computed for each experimental class (Em, Ea, Ev, Ec) with the total experimental group (E) and the two control groups (Cn and Co) using the MANOVA program (4). (See Appendix B-1.) The data were converted to standard scores to indicate deviation from age norms.

In the MANOVA program, the Wilk's tests of overall significance showed p less than .05 for the pertinent dependent variables selected for the sub-studies reported in Appendix D (except as noted). This analysis justified rejection at this level or better of the null hypothesis (upon which the analyses are based) that no significant differences among each specific experimental class, the combined experimental group, and the control groups existed. The Wilk's analysis is provided in Table D-1 and the paired t-tests are given in Tables D-2 and D-3.

Table D-1. Wilk's Test of Overall Significance of Differences for Boys and for Girls Among the Experimental Classes, the Combined Experimental Group, and the Control Groups

Dependent Variables	Em	Ea	Ev	Ec
	with E, Cn, Co			
	p less than			
BOYS				
A. Total Motor Test[a]	.001			
B. ITPA 5 - Vocal Encoding [ac]	.026	.017	.029	.002
C. Beery, Developmental Forms[a]			.004	
D. ITPA 4 - Visual-Motor Association[ab]	.041	.023	.004	.011
E. ITPA L.Q.[b]	.001	.027	.007	.002
F. PPVT I.Q.[b]	ns	ns	ns	ns
GIRLS				
A. Total Motor Test[a]	.001			
B. ITPA 5 - Vocal Encoding[ac]	.001	.002	.001	.001
C. Beery, Developmental Forms[a]			.007	
D. ITPA 4 - Visual-Motor Association[ab]	.023	ns	.007	.021
E. ITPA L.Q.[b]	.001	.001	.003	.005
F. PPVT I.Q.[b]	.020	ns	.049	ns

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[a] Dependent variables pertinent to each developmental skills class (See Figure D-1 and Tables D-4 and D-5).

[b] Dependent variables pertinent to cognition (See Figure D-4 and Tables D-4 and D-5).

[c] Dependent variable pertinent to expression (See Figure D-7 and Tables D-4 and D-5).

Table D-2. Significance of Growth Differences for Boys in Each Experimental Class and the Combined Experimental Group Compared with the Control Groups

	One-sided t-Test	
Class/Group	Cn	Co
A. TOTAL MOTOR TEST		
Em - Motor Class	>.005	>.005
Cn - Control Group with Nursery School		ns
B. ITPA 5 - VOCAL ENCODING		
Em - Motor Class	ns	ns
Ea - Auditory-Language Class	>.01	>.005
Ev - Visual Class	ns	>.025
Ec - Cognitive Class	ns	>.05
E - Combined Experimental Group	>.05	>.005
Cn - Control Group with Nursery School		ns
C. BEERY-BUKTENICA DEVELOPMENTAL FORM SEQUENCE		
Ev - Visual Class	>.025	>.005
Cn - Control Group with Nursery School		>.05*
D. ITPA 4 - VISUAL MOTOR ASSOCIATION		
Em - Motor Class	ns	>.025
Ea - Auditory-Language Class	ns	ns
Ev - Visual Class	ns	ns
Ec - Cognitive Class	>.025	>.005
E - Combined Experimental Group	ns	>.005*
Cn - Control Group with Nursery School		ns

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*Significant only when computing each class separately (Em, Ea, Ev, Ec) with groups E, Cn, Co.

Table D-2. (continued)

Class/Group	One-sided t-Test Cn	 Co
E. ITPA L.Q. - COMPOSITE SCORE		
Em - Motor Class	ns	>.05
Ea - Auditory-Language Class	ns	ns
Ev - Visual Class	ns	>.05
Ec - Cognitive Class	ns	ns
E - Combined Experimental Group	ns	>.005
Cn - Control Group with Nursery School		ns
F. PEABODY PICTURE VOCABULARY TEST I.Q.		
Em - Motor Class	ns	ns
Ea - Auditory-Language Class	ns	ns
Ev - Visual Class	ns	ns
Ec - Cognitive Class	ns	ns
E - Combined Experimental Group	ns	ns
Cn - Control Group with Nursery School		ns

Table D-3. Significance of Growth Differences for Girls in Each Experimental Class and the Combined Experimental Group Compared with the Control Groups

Class/Group	One-sided t-Test	
	Cn	Co
A. TOTAL MOTOR TEST		
Em - Motor Class	>.005	>.005
Cn - Control Group with Nursery School		ns
B. ITPA 5 - VOCAL ENCODING		
Em - Motor Class	>.01	>.005
Ea - Auditory-Language Class	>.05	>.025
Ev - Visual Class	>.025	>.01
Ec - Cognitive Class	>.025	>.01
E - Combined Experimental Group	>.005	>.005
Cn - Control Group with Nursery School		ns
C. BEERY-BUKTENICA DEVELOPMENTAL FORM SEQUENCE		
Ev - Visual Class	>.01	>.005
Cn - Control Group with Nursery School		ns
D. ITPA 4 - VISUAL MOTOR ASSOCIATION		
Em - Motor Class	ns	ns
Ea - Auditory-Language Class	ns	ns
Ev - Visual Class	ns	ns
Ec - Cognitive Class	ns	ns
E - Combined Experimental Group	ns	ns
Cn - Control Group with Nursery School		ns

Table D-3. (continued)

Class/Group	One-sided t-Test	
	Cn	Co
E. ITPA L.Q. - COMPOSITE SCORE		
Em - Motor Class	>.01	>.005
Ea - Auditory-Language Class	ns	>.005
Ev - Visual Class	ns	ns
Ec - Cognitive Class	ns	>.025
E - Combined Experimental Group	ns	>.005
Cn - Control Group with Nursery School		>.01
F. PEABODY PICTURE VOCABULARY TEST I.Q.		
Em - Motor Class	>.05	>.05
Ea - Auditory-Language Class	ns	ns
Ev - Visual Class	>.025	>.025
Ec - Cognitive Class	ns	ns
E - Combined Experimental Group	>.025	>.05*
Cn - Control Group with Nursery School		ns

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*Significant only when computing each class separately (Em, Ea, Ev, Ec) with groups E, Cn, Co.

Results of Growth in Specific Developmental Skills in each Experimental Class and in the Control Groups.

The test used to assess a specific developmental skill pertinent to each of the four experimental classes is identified in Figure D-1. Tables D-4 and D-5 (Parts A, B, C, D) present data on age, pretest and posttest mean scores, posttest-pretest growth, pretest and posttest standard scores (deviation from the age norm) and posttest-pretest standard score differences. These data are provided separately for boys and girls in each experimental class and the control groups. Figures D-2 and D-3 show these data graphically. In the following discussion of growth differences, the class or group making the most gain is reported first. All differences were statistically significant unless otherwise noted.

CLASS RECEIVING SPECIFIC PROGRAM	MEASUREMENTS OF SPECIFIC AREAS
MOTOR (Em) Boys and Girls	Total Gross Motor
AUDITORY-LANGUAGE (Ea) Boys and Girls	ITPA 5 - Vocal Encoding
VISUAL (Ev) Boys and Girls	Beery
COGNITIVE (Ec) Boys	ITPA 4 - Visual-Motor Association
Girls	ITPA 4 - (Not Significant)

Figure D-1. Pertinent Dependent Variables Showing Significant Levels of Functioning in Each Developmental Skills Area

Table D-4. Posttest-Pretest Significant Growth Differences in Selected Developmental Skills for Boys in Experimental Classes, The Combined Experimental Group and the Control Groups

Class/ Group	Pretest Mean Age	Mean		Posttest-Pretest Growth	Standard Score*		Post-Pre Standard Score Difference
		Pretest	Posttest		Pretest	Posttest	
A. TOTAL MOTOR TEST (Motor Class)							
Motor (Em)	4-4	10.46	21.82	11.36	-.89	.39	+1.28
Auditory (Ea)	4-5	19.92	24.25	4.33	.73	.91	+ .18
Visual (Ev)	4-5	20.27	27.00	6.73	.79	1.49	+ .70
Cognitive (Ec)	4-7	18.82	24.91	6.09	.57	.90	+ .33
Control (Cn)	4-6	16.50	20.72	4.22	.19	.15	- .04
Control (Co)	4-5	16.06	20.66	4.59	.07	.14	+ .07
B. ITPA 5 - VOCAL ENCODING (Auditory and Language Class and Expression)							
Motor (Em)	4-4	11.64	13.82	2.18	.34	.44	+ .10
Auditory (Ea)	4-5	7.58	14.50	6.92	-.78	.59	+1.37
Visual (Ev)	4-5	13.82	19.64	5.82	.94	1.71	+ .77
Cognitive (Ec)	4-7	13.55	18.46	4.91	.87	1.46	+ .59
Experimental (E)	4-5	11.56	16.56	5.00	.32	1.04	+ .72
Control (Cn)	4-6	9.72	12.84	3.13	-.20	.23	+ .43
Control (Co)	4-5	10.94	12.63	1.69	.14	.18	+ .04
C. BEERY-BUKTENICA DEVELOPMENTAL FORMS SEQUENCE (Visual Class)							
Motor (Em)	4-4	5.00	7.46	2.46	.00	.06	+ .06
Auditory (Ea)	4-5	5.17	7.42	2.25	-.15	-.11	+ .04
Visual (Ev)	4-5	4.46	8.18	3.73	-.47	.08	+ .55
Cognitive (Ec)	4-7	7.09	9.64	2.55	.34	.41	+ .07
Control (Cn)	4-6	5.78	8.28	2.50	-.10	.12	+ .22
Control (Co)	4-5	5.19	6.94	1.75	-.14	-.32	- .18

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*S.S.-Deviation of the Standard Score from the age norm.

Table D-4. (continued)

Class/ Group	Pretest Mean Age	Mean		Posttest-Pretest Growth	Standard Score*		Post-Pre Standard Score Difference
		Pretest	Posttest		Pretest	Posttest	
D. ITPA 4 - VISUAL-MOTOR ASSOCIATION (Cognitive Class and Cognition)							
Motor (Em)	4-4	9.64	14.55	4.91	-.04	.77	+ .81
Auditory (Ea)	4-5	10.00	12.33	2.33	.04	.23	+ .19
Visual (Ev)	4-5	11.46	15.46	4.00	.34	1.02	+ .68
Cognitive (Ec)	4-7	10.64	16.09	5.45	.17	1.17	+1.00
Experimental (E)	4-5	10.42	14.56	4.13	.13	.79	+ .66
Control (Cn)	4-6	9.00	11.88	2.88	-.17	.12	+ .29
Control (Co)	4-5	10.19	11.81	1.63	.08	.10	+ .02
E. ITPA L.Q. (Cognition)							
Motor (Em)	4-4	107.27	116.91	9.64	.45	1.06	+ .61
Auditory (Ea)	4-5	91.83	100.08	8.25	-.51	.01	+ .52
Visual (Ev)	4-5	111.18	122.91	11.73	.70	1.43	+ .73
Cognitive (Ec)	4-7	119.36	126.64	7.27	1.21	1.67	+ .46
Experimental (E)	4-5	107.07	116.27	9.20	.44	1.02	+ .58
Control (Cn)	4-6	105.28	109.63	4.34	.33	.60	+ .27
Control (Co)	4-5	105.66	106.78	1.13	.35	.42	+ .07
F. PPVT I.Q. (Cognition)							
Motor (Em)	4-4	105.00	118.00	13.00	.33	1.20	+ .87
Auditory (Ea)	4-5	97.33	106.25	8.92	-.18	.42	+ .60
Visual (Ev)	4-5	112.18	121.36	9.18	.81	1.42	+ .61
Cognitive (Ec)	4-7	117.09	119.46	2.37	1.14	1.30	+ .16
Experimental (E)	4-5	107.67	116.04	8.38	.51	1.07	+ .56
Control (Cn)	4-6	105.47	114.88	9.41	.36	.99	+ .63
Control (Co)	4-5	107.72	112.31	4.59	.51	.82	+ .31

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*S.S.-Deviation of the Standard Score from the age norm.

Table D-5. Posttest-Pretest Significant Growth Differences in Selected Developmental Skills for Girls in Experimental Classes, The Combined Experimental Group and the Control Groups

Class/ Group	Pretest Mean Age	Mean		Posttest-Pretest Growth	Standard Score*		Post-Pre Standard Score Difference
		Pretest	Posttest		Pretest	Posttest	
A. TOTAL MOTOR TEST (Motor Class)							
Motor (Em)	4-2	11.90	25.80	13.90	-.30	.68	+ .98
Auditory (Ea)	4-7	20.73	27.00	6.27	.07	.59	+ .52
Visual (Ev)	4-6	20.80	29.00	8.20	.08	.94	+ .86
Cognitive (Ec)	4-6	20.64	24.79	4.14	.05	.26	+ .21
Control (Cn)	4-7	17.88	23.59	5.71	-.44	-.16	+ .28
Control (Co)	4-6	19.82	23.91	4.09	-.09	.12	+ .21
B. ITPA 5 - VOCAL ENCODING (Auditory and Language Class and Expression)							
Motor (Em)	4-2	8.20	13.90	5.70	-.23	.95	+1.19
Auditory (Ea)	4-7	10.46	15.91	5.46	.01	.90	+ .89
Visual (Ev)	4-6	13.30	19.20	5.90	.80	1.61	+ .81
Cognitive (Ec)	4-6	10.57	16.64	6.07	.04	1.06	+1.02
Experimental (E)	4-5	10.62	16.42	5.80	.06	1.01	+ .95
Control (Cn)	4-7	12.17	14.20	2.02	.49	.52	+ .03
Control (Co)	4-6	11.24	12.56	1.32	.23	.17	- .06
C. BEERY-BUKTENICA DEVELOPMENTAL FORMS SEQUENCE (Visual Class)							
Motor (Em)	4-2	4.60	7.70	3.10	-.37	.37	+ .74
Auditory (Ea)	4-7	5.64	7.91	2.27	-.59	-.25	+ .34
Visual (Ev)	4-6	5.80	9.90	4.10	-.37	.69	+1.06
Cognitive (Ec)	4-6	6.64	9.36	2.71	.07	.46	+ .39
Control (Cn)	4-7	5.51	7.59	2.07	-.66	-.48	+ .18
Control (Co)	4-6	5.91	7.56	1.65	-.32	-.29	+ .03

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*S.S.-Deviation of the Standard Score from the age norm.

Table D-5. (continued)

Class/ Group	Pretest Mean Age	Mean		Posttest-Pretest Growth	Standard Score*		Post-Pre Standard Score Difference
		Pretest	Posttest		Pretest	Posttest	
D. ITPA 4 - VISUAL-MOTOR ASSOCIATION (Cognitive Class and Cognition)							
Motor (Em)	4-2	8.60	13.80	5.20	-.33	.83	+1.16
Auditory (Ea)	4-7	9.46	12.36	2.90	-.02	.24	+ .31
Visual (Ev)	4-6	12.30	15.80	3.50	.51	1.10	+ .59
Cognitive (Ec)	4-6	12.21	14.86	2.64	.49	.87	+ .38
Experimental (E)	4-5	10.76	14.22	3.47	.20	.71	+ .51
Control (Cn)	4-7	10.59	12.49	1.90	.16	.27	+ .11
Control (Co)	4-6	10.74	13.09	2.35	.20	.42	+ .22
E. ITPA L.Q. (Cognition)							
Motor (Em)	4-2	98.60	111.40	12.80	-.09	.71	+ .80
Auditory (Ea)	4-7	96.91	108.82	11.90	-.19	.55	+ .74
Visual (Ev)	4-6	116.00	119.50	3.50	1.00	1.22	+ .22
Cognitive (Ec)	4-6	115.93	121.79	5.85	1.00	1.36	+ .36
Experimental (E)	4-5	107.44	115.80	8.36	.47	.99	+ .52
Control (Cn)	4-7	106.78	111.02	4.24	.42	.69	+ .27
Control (Co)	4-6	109.50	107.00	-2.50	.59	.44	- .15
F. PPVT I.Q. (Cognition)							
Motor (Em)	4-2	99.40	110.70	11.30	-.04	.71	+ .75
Auditory (Ea)	4-7	99.91	109.27	9.36	-.01	.62	+ .63
Visual (Ev)	4-6	103.70	115.20	11.50	.25	1.01	+ .76
Cognitive (Ec)	4-6	111.79	112.86	1.07	.79	.86	+ .07
Experimental (E)	4-5	104.33	112.02	7.69	.29	.80	+ .51
Control (Cn)	4-7	106.93	109.12	2.20	.46	.61	+ .15
Control (Co)	4-6	103.85	107.00	3.15	.26	.47	+ .21

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*S.S.-Deviation of the Standard Score from the age norm.

Motor Area for Boys. The total motor test results showed a mean posttest-pretest gain in raw score points (r.s.) of 11.36 r.s. for Em boys compared with 4.22 r.s. for Cn and 4.59 r.s. for Co boys. Based on deviations from the age norm, the posttest-pretest standard score (s.s.) differences were: Em boys +1.28 s.s., Cn boys -.04 s.s., and Co boys +.07 s.s. (See Table D-4, Part A.)

Motor Area for Girls. The total motor test results showed a mean posttest-pretest gain in score of 13.90 r.s. for Em girls compared with 5.71 r.s. for Cn and 4.09 r.s. for Co girls. Standard score differences were: Em girls +.98 s.s., Cn girls +.28 s.s., and Co girls +.21 s.s. (See Table D-5, Part A.)

Auditory-Language Area for Boys. The ITPA 5 - Vocal Encoding results showed a mean posttest-pretest gain in score of 6.92 r.s. for Ea boys compared with 3.13 r.s. for Cn and 1.69 r.s. for Co boys. Standard score differences were: Ea boys +1.37 s.s., Cn boys +.43 s.s., and Co boys +.04 s.s. (See Table D-4, Part B.)

Auditory-Language Area for Girls. The ITPA 5 results showed a mean posttest-pretest gain in score of 5.46 r.s. for Ea girls compared with 2.02 r.s. for Cn and 1.32 r.s. for Co girls. Standard score differences were: Ea girls +.89 s.s., Cn girls +.03 s.s., and Co girls -.06 s.s. (See Table D-5, Part B.)

Visual Area for Boys. The Beery-Buktenica Developmental Form Sequence results showed a mean posttest-pretest gain in score of 3.73 r.s. for Ev boys compared with 2.50 r.s. for Cn and 1.75 r.s. for Co boys. Standard score differences were: Ev boys +.55 s.s., Cn boys +.22 s.s., and Co boys -.18 s.s. (See Table D-4, Part C.)

Visual Area for Girls. The Beery results showed a mean posttest-pretest gain in score of 4.10 r.s. for Ev girls compared with 2.07 r.s. for Cn and 1.65 r.s. for Co girls. Standard score differences were: Ev girls +1.06 s.s., Cn girls +.18 s.s., and Co girls +.03 s.s. (See Table D-5, Part C.)

Cognitive Area for Boys. The ITPA 4 - Visual Motor Association results showed a mean posttest-pretest gain in score of 5.45 r.s. for Ec boys compared with 2.88 r.s. for Cn and 1.63 r.s. for Co boys. Standard score differences were: Ec boys +1.00 s.s., Cn boys +.29 s.s., and Co boys +.02 s.s. (See Table D-4, Part D.)

Cognitive Area for Girls. The ITPA 4 results showed a mean posttest-pretest gain in score of 2.64 r.s. for Ec girls compared with 1.90 r.s. for Cn and 2.35 r.s. for Co girls. Standard score differences were: Ec girls +.38 s.s., Cn girls +.11 s.s., and Co girls +.22 s.s. Growth differences were not statistically significant for girls in the cognitive area. (See Table D-5, Part D.)

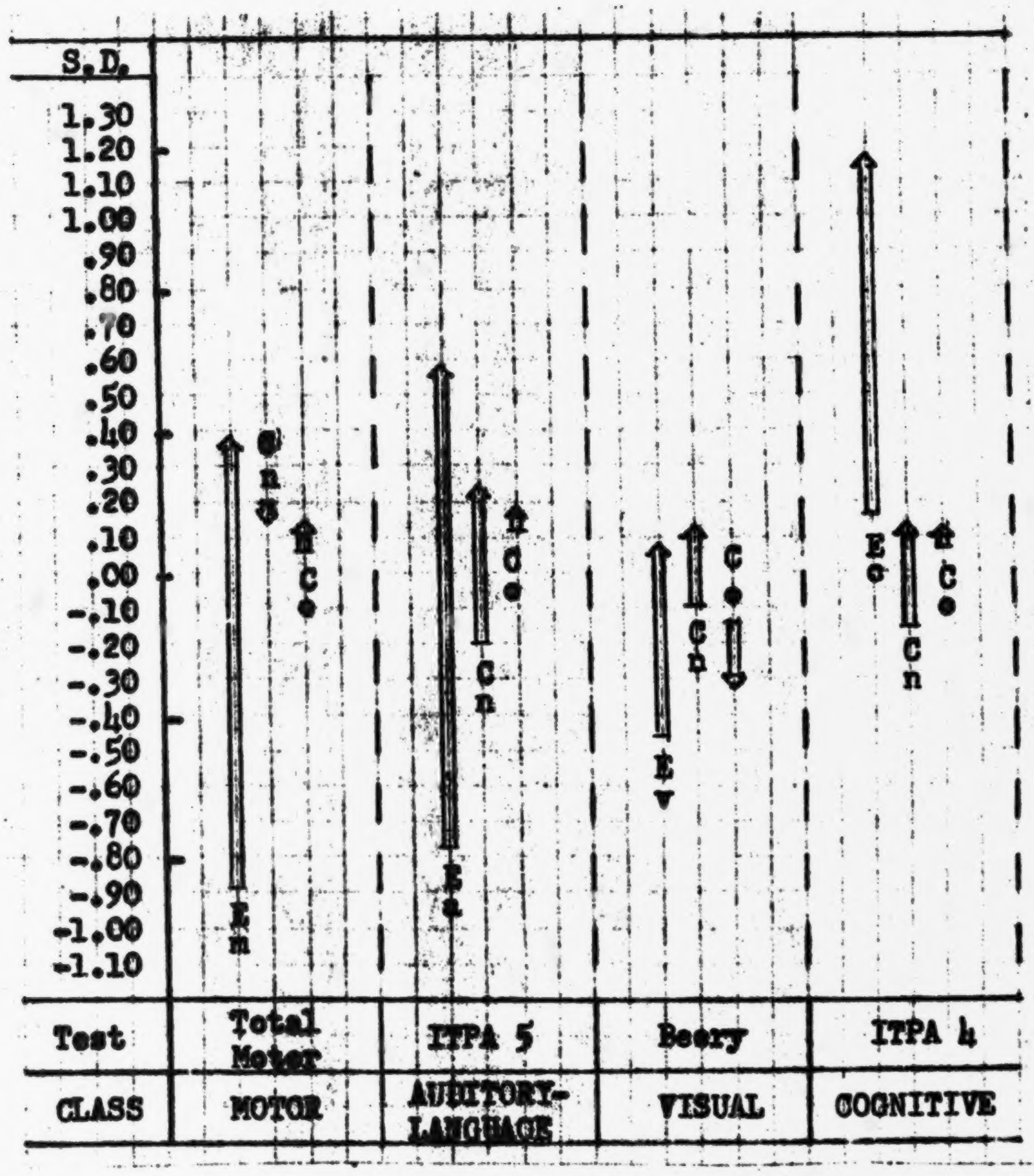

Figure D-2. Growth Differences in Specific Areas for Boys in the Four Experimental Classes Emphasizing These Developmental Skills Compared with Boys in the Control Groups

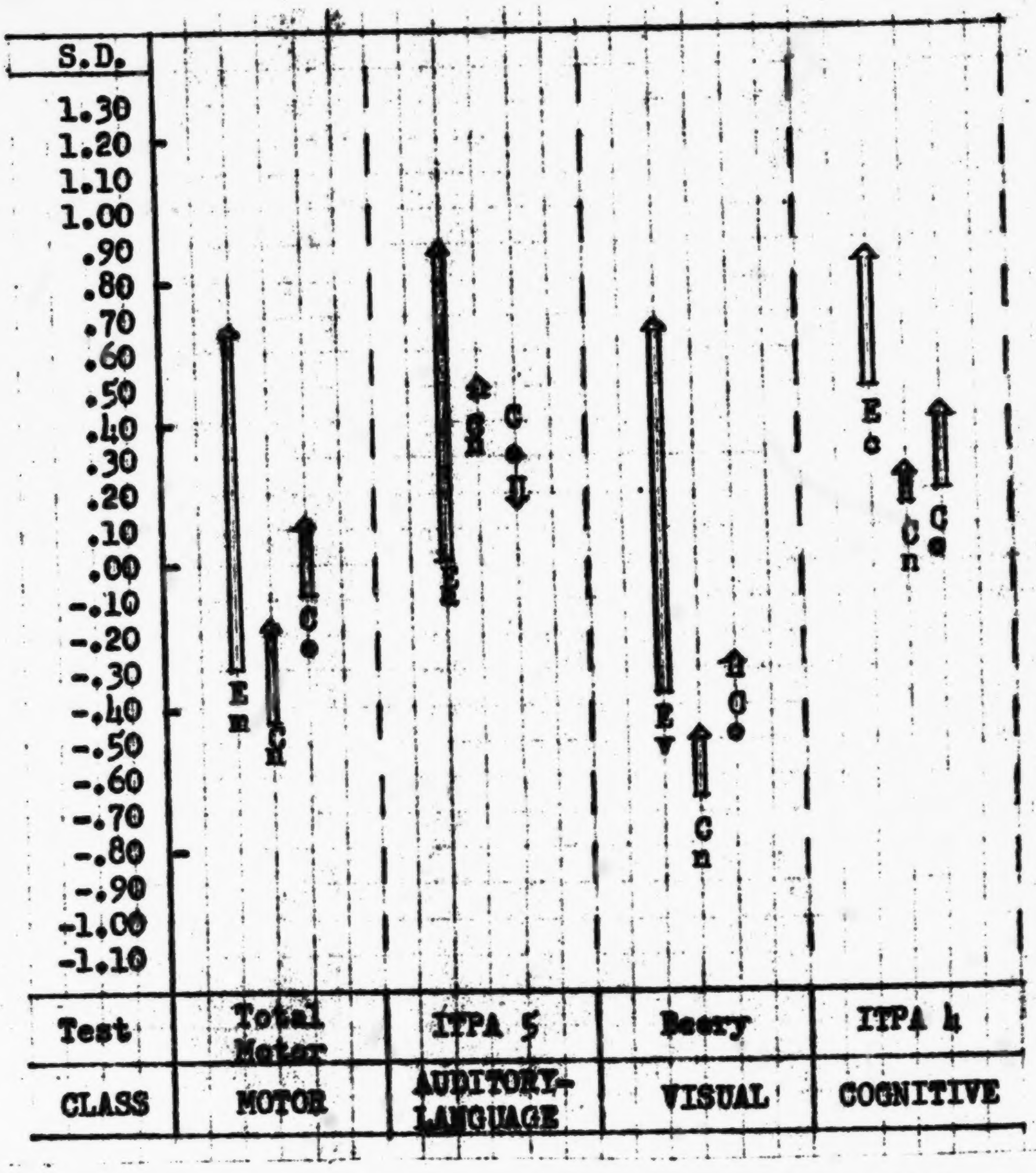

Figure D-3. Growth Differences in Specific Areas for Girls in the Four Experimental Classes Emphasizing These Developmental Skills Compared with Girls in the Control Groups

Summary of Growth in Specific Experimental Classes and in Control Groups. In every comparison but one, the experimental class participating in a skills development program to meet specific needs identified by individual assessment showed more growth in the specific area at a significant level than either of the control groups, as measured by a test selected to ascertain level of functioning in that area. The exception was in the Cognitive class girls who showed greater, but not statistically significant, growth than either of the control groups.

Results of Growth in Cognition.

The principal variables used to measure cognition are identified in Figure D-4. Tables D-4 and D-5 (Parts D, E, F) provide data on age, pretest and posttest mean scores, posttest-pretest growth, pretest and posttest standard scores, and posttest-pretest standard score differences separately for boys and girls. The data are given for each experimental class (Em, Ea, Ev, Ec), for the combined experimental group (E), and for the control groups (Cn and Co). Figures D-5 and D-6 show the data graphically.

Measurements of Cognition

ITPA 4 - Visual Motor Association
ITPA L.Q. - Composite score
Peabody Picture Vocabulary Test I.Q.

Figure D-4. Dependent Variables Showing Significant Growth Differences in Cognition

The following results are reported by test in the order given in Figure 4, separately for boys and girls. The class or group making the greatest gain is reported first.

Growth in Cognition for Boys. ITPA 4, Visual-Motor Association, data gives posttest-pretest growth in raw score (r.s.). In order of greatest growth, boys in the experimental classes were: Ec (cognitive) boys 5.45 r.s., Em (motor) boys 4.91 r.s., Ev (visual) boys 4.00 r.s., and Ea (auditory-language boys) 2.33 r.s. The combined experimental group (E) gained 4.13 r.s., the control group with nursery school experience (Cn) gained 2.88 r.s., and the control group with no school (Co) gained 1.63 r.s. One score, Ec boys, was statistically significant with Cn and Co boys. Two scores, Em and E boys, were statistically significant with Co boys.

ITPA L.Q. data for boys in experimental classes in order of greatest growth were: Ev boys 11.73 points, Em boys 9.64 points, Ea boys 8.25 points, and Ec boys 7.27 points. In the three groups E boys gained 9.20 points, Cn boys gained 4.34 points, and Co boys gained 1.13 points. Three scores, Ev, Em, and E boys were statistically significant with Co boys.

PPVT I.Q. data for boys in experimental classes in order of greatest growth were: Em boys 13.00 points, Ev boys 9.18 points, Ea boys 8.92 points, and Ec boys 2.37 points. In the three groups Cn boys gained 9.41 points, E boys gained 8.38 points, and Co boys gained 4.59 points. None of the scores was statistically significant.

Growth in Cognition for Girls. ITPA 4, Visual-Motor Association, data for girls in experimental classes in order of greatest growth were: Em girls 5.20 r.s., Ev girls 3.50 r.s., Ea girls 2.90 r.s., and Ec girls 2.64 r.s. In the three groups E girls gained 3.47 r.s., Co girls gained 2.35 r.s., and Cn girls gained 1.90 r.s. None of the scores was statistically significant.

ITPA L.Q. data for girls in experimental classes in order of greatest growth were: Em girls 12.80 points, Ea girls 11.90 points, Ec girls 5.85 points, and Ev girls 3.50 points. In the three groups E girls gained 8.36 points and Cn girls 4.24 points, while Co girls lost 2.50 points. One score, Em girls was statistically significant with Cn and Co girls. Four scores, Ea, Ec, E and Cn girls were statistically significant with Co girls.

PPVT I.Q. data for girls in experimental classes in order of greatest growth were: Ev girls 11.50 points, Em girls 11.30 points, Ea girls 9.36 points and Ec girls 1.07 points. In the three groups E girls gained 7.69 points, Co girls gained 3.15 points, and Cn girls gained 2.20 points. Three scores, Ev, Em, and E girls were statistically significant with Cn and Co girls.

Summary of Growth in Cognition. Growth in Cognition based on posttest-pretest differences on ITPA 4 showed that boys in the cognitive class made a significantly greater gain than boys in the control groups with and without nursery school experience. Boys in the motor class and combined experimental group made significantly greater gains than boys in the control group with no school experience. Boys in the auditory-language and visual classes did not gain significantly compared with boys in the control groups.

For ITPA L.Q., posttest-pretest growth, boys in motor and visual classes and in the combined experimental group made significantly greater gains than boys in the control group with no school experience. Boys in auditory-language and cognitive classes did not gain significantly.

For PPVT I.Q. posttest-pretest growth, none of the differences was significant.

Growth in cognition based on posttest-pretest differences for girls in ITPA 4 showed none of the differences was significant.

For ITPA L.Q. growth differences, girls in the motor class made a significantly greater gain than girls in either control group. Girls in the auditory-language and cognitive classes, in the combined experimental group and in the control group with nursery school experience, made greater gains than girls with no school experience. Girls in the visual class made no significant gain.

For PPVT I.Q., girls in motor and visual classes and in the combined experimental group made significantly greater gains than girls in either control group. Girls in auditory-language and cognitive classes did not gain significantly compared to girls in the control groups.

When the two control groups were compared, boys with nursery school experience grew more, but not significantly, than boys with no school experience. Girls with nursery school experience grew significantly more on one test; girls with no school experience grew more on two tests, but not significantly, than girls who attended nursery school.

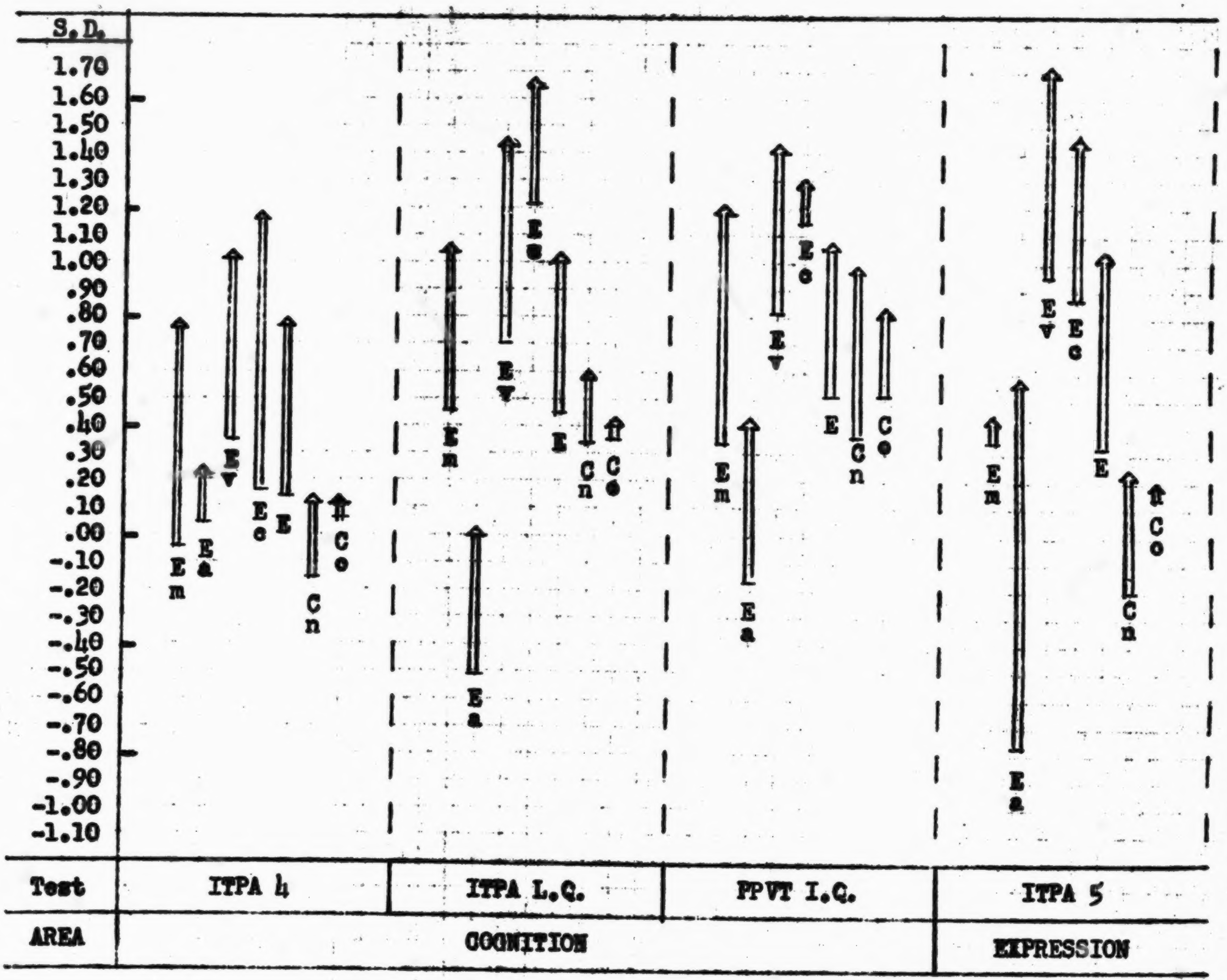

Figure D-5. Growth in Cognition and Expression of Boys In the Four Experimental Classes and in the Combined Experimental Group Compared with Boys in the Control Groups

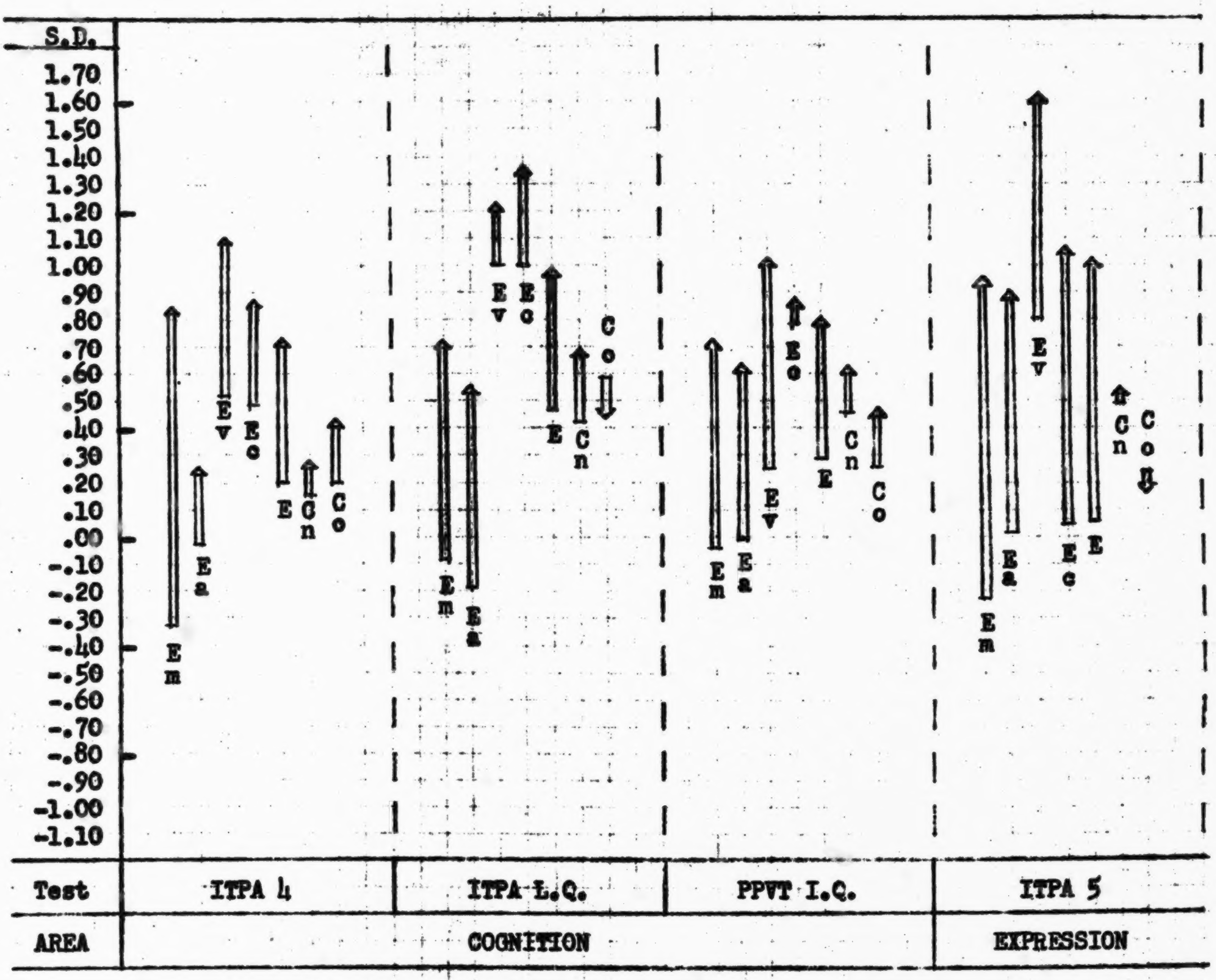

Figure D-6. Growth in Cognition and Expression of Girls In the Four Experimental Classes and in the Combined Experimental Group Compared with Girls in the Control Groups

Results of Growth in Expression.

ITPA 5, Vocal Encoding, was used as a measure of expression as shown in Figure D-7. Tables D-4, Part B, and D-5, Part B, provide data on age, pretest and posttest mean scores, posttest-pretest growth, pretest and posttest standard scores, and posttest-pretest standard score differences separately for boys and girls. The data are given for each experimental class (Em, Ea, Ev, Ec), for the combined experimental group (E), and for the control groups (Cn and Co). Figures D-5 and D-6 referred to previously show the data graphically.

Measurement of Expression
ITPA 5 - Vocal Encoding

Figure D-7. Dependent Variable Showing Significant Growth Differences in Expression

Growth in Expression for Boys. ITPA 5, Vocal Encoding, data gives posttest-pretest growth in raw score (r.s.). In order of greatest growth, boys in the experimental classes were: Ea boys 6.92 r.s., Ev boys 5.82 r.s., Ec boys 4.91 r.s., and Em boys 2.18 r.s. Among the three groups, E boys gained 5.00 r.s., Cn boys gained 3.13 r.s., and Co boys gained 1.69 r.s. Two scores, Ea and E, were statistically significant with Cn and Co boys; two scores, Ev and Ec boys, were statistically significant with Co boys.

Growth in Expression for Girls. ITPA 5 data for girls in experimental classes in order of greatest growth were: Ec girls 6.07 r.s., Ev girls 5.90 r.s., Em girls 5.70 r.s., Ea girls 5.46 r.s. Among the three groups E girls gained 5.80 r.s., Cn girls gained 2.02 r.s., and Co girls gained 1.32 r.s. All five scores for experimental girls (Em, Ea, Ev, Ec, E) were statistically significant with Cn and Co girls.

Summary of Growth in Expression. The results based on posttest-pretest growth of boys in expression showed that the auditory-language class and the combined experimental group made significantly greater gains than boys in the control groups with and without nursery school. Boys in the visual and cognitive classes made significantly greater gains than boys in the control group with no school experience. Boys in the motor class did not gain significantly compared with boys in the control groups.

The posttest-pretest growth of girls in expression showed all four classes and the combined experimental group made significantly greater gains than both control groups.

When the two control groups were compared, the group which had attended nursery school made more gain, although the difference was not statistically significant for either boys or girls.

Results of Growth in Skills in Areas Not Specifically Programmed.

In addition to the measurements showing growth already reported in this appendix, results of the tests listed in Figure D-8 also pointed up gains made by specific groups. However, the growth was in an area not specifically programmed.

OTHER TESTS SHOWING SIGNIFICANT GROWTH		
Boys	Girls	Developmental Skills Area
ITPA 6	Total Motor ITPA 6	Motor
	ITPA 1	Auditory
	Beery ITPA 2	Visual
	ITPA 9	Cognitive

Figure D-8. Dependent Variables Showing Significant Growth in Areas Not Specifically Programmed

Tables D-8 and D-9 (Parts A-F) provide data on age, pretest and posttest mean scores, posttest-pretest growth, pretest and posttest standard scores and posttest-pretest standard score differences separately for boys and girls. Data are given for each experimental class (Em, Ea, Ev, Ec), and for the three groups (E, Cn, Co). Only the classes not programmed for the skill in question and the control groups for which differences were statistically significant in each instance (underlined in Tables D-8 and D-9) are reported. Tables D-6 and D-7 show the level of significance of the growth differences.

Table D-6. Significance of Growth Differences for Boys in Developmental Skills Areas not Specifically Programmed

Class/Group	One-sided t-Test	
	Cn	Co
A. ITPA 6 - MOTOR ENCODING		
Ec - Cognitive Class	>.01	>.005
E - Combined Experimental Group	>.05	>.025
Cn - Control Group with Nursery School		ns

Table D-7. Significance of Growth Differences for Girls in Developmental Skills Areas not Specifically Programmed

Class/Group	One-sided t-Test	
	Cn	Co
A. TOTAL MOTOR TEST		
Em - Motor Class	>.005	>.005
Ev - Visual Class	ns	>.025
E - Combined Experimental Group	ns	>.005
Cn - Control Group with Nursery School		ns
B. ITPA 6 - MOTOR ENCODING		
Ec - Cognitive Class	>.05	>.005
E - Combined Experimental Group	ns	>.025*
Cn - Control Group with Nursery School		ns

---

*Significant only when computing each class separately (Em, Ea, Ev, Ec) with groups, E, Cn, Co.

Table D-7. (continued)

Class/Group	One-sided t-Test	
	Cn	Co
C. ITPA 1 - AUDITORY DECODING		
Em - Motor Class	>.05	>.005
E - Combined Experimental Group	ns	>.005
Cn - Control Group with Nursery School		ns
D. BEERY-BUKTENICA DEVELOPMENTAL FORM SEQUENCE		
Em - Motor Class	ns	>.025
Ev - Visual Class	>.01	>.005
E - Combined Experimental Group	>.05	>.005
Cn - Control Group with Nursery School		ns
E. ITPA 2 - VISUAL DECODING		
Ec - Cognitive Class	>.005	>.01
E - Combined Experimental Group	ns	ns
Cn - Control Group with Nursery School		ns
F. ITPA 9 - VISUAL MOTOR SEQUENCING		
Em - Motor Class	>.025	>.01
Ea - Auditory-Language Class	>.05	>.025
E - Combined Experimental Group	ns	>.01*
Cn - Control Group with Nursery School		ns

---

*Significant only when computing each class separately (Em, Ea, Ev, Ec) with groups E, Cn, Co.

Table D-8. Dependent Variable for Boys Showing Growth in an Area not Specifically Programmed

Class/ Group	Pretest Mean Age	Mean		Posttest-Pretest Growth	Standard Score*		Post-Pre Standard Score Difference
		Pretest	Posttest		Pretest	Posttest	
ITPA 6 - MOTOR ENCODING							
Motor (Em)	4-4	10.00	12.91	2.91	-.43	.32	+ .75
Auditory (Ea)	4-5	10.33	13.67	3.33	-.35	.52	+ .87
Visual (Ev)	4-5	11.18	14.18	3.00	-.15	.66	+ .81
Cognitive (Ec)	4-7	11.55	16.91	5.36	-.06	1.39	+1.45
Experimental (E)	4-5	10.76	14.40	3.64	-.25	.72	+ .97
Control (Cn)	4-6	11.09	12.72	1.63	-.17	.27	+ .44
Control (Co)	4-5	10.91	12.63	1.72	-.21	.24	+ .45

---

*S.S.-Deviation of the Standard Score from the age norm.

Table D-9. Dependent Variables for Girls Showing Growth in Areas not Specifically Programmed

Class/ Group	Pretest Mean Age	Mean		Posttest-Pretest Growth	Standard Score*		Post-Pre Standard Score Difference
		Pretest	Posttest		Pretest	Posttest	
A. TOTAL MOTOR							
Motor (Em)	4-2	11.90	25.80	13.90	-.30	.68	+ .98
Auditory (Ea)	4-7	20.73	27.00	6.27	.07	.59	+ .52
Visual (Ev)	4-6	20.80	29.00	8.20	.08	.94	+ .86
Cognitive (Ec)	4-6	20.64	24.79	4.14	.05	.26	+ .21
Experimental (E)	4-5	18.76	26.49	7.73	-.14	.53	+ .67
Control (Cn)	4-7	17.88	23.59	5.71	-.44	-.16	+ .28
Control (Co)	4-6	19.82	23.91	4.09	-.09	.12	+ .21
B. ITPA 6 - MOTOR ENCODING							
Motor (Em)	4-2	8.60	11.40	2.80	-.22	-.10	+ .12
Auditory (Ea)	4-7	12.46	13.91	1.46	.15	.59	+ .44
Visual (Ev)	4-6	12.00	13.80	1.80	.04	.56	+ .52
Cognitive (Ec)	4-6	9.71	14.21	4.50	-.50	.67	+1.17
Experimental (E)	4-5	10.64	13.42	2.78	-.28	.45	+ .73
Control (Cn)	4-7	10.49	12.73	2.24	-.31	.27	+ .58
Control (Co)	4-6	11.56	12.47	.91	-.06	.20	+ .26
C. ITPA 1 - AUDITORY DECODING							
Motor (Em)	4-2	13.00	21.00	8.00	.24	1.27	+1.03
Auditory (Ea)	4-7	15.18	19.91	4.73	.24	.34	+ .10
Visual (Ev)	4-6	18.50	20.80	2.30	.83	.52	- .31
Cognitive (Ec)	4-6	19.93	24.21	4.29	1.08	1.20	+ .12
Experimental (E)	4-5	16.91	21.69	4.78	.55	.70	+ .15
Control (Cn)	4-7	16.76	20.42	3.66	.53	.44	- .09
Control (Co)	4-6	17.71	19.06	1.35	.69	.17	- .52

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*S.S.-Deviation of the Standard Score from the age norm.

Table D-9. (continued)

Class/ Group	Pretest Mean Age	Mean		Posttest-Pretest Growth	Standard Score*		Post-Pre Standard Score Difference
		Pretest	Posttest		Pretest	Posttest	
D. BEERY-BUKTENICA DEVELOPMENTAL FORM SEQUENCE							
Motor (Em)	4-2	4.60	7.70	3.10	-.37	.37	+ .74
Auditory (Ea)	4-7	5.64	7.91	2.27	-.59	-.25	+ .34
Visual (Ev)	4-6	5.80	9.90	4.10	-.37	.69	+1.06
Cognitive (Ec)	4-6	6.64	9.36	2.71	.07	.46	+ .39
Experimental (E)	4-5	5.76	8.76	3.00	-.26	.21	+ .47
Control (Cn)	4-7	5.51	7.59	2.07	-.66	-.48	+ .18
Control (Co)	4-6	5.91	7.56	1.65	-.32	-.29	+ .03
E. ITPA 2 - VISUAL DECODING							
Motor (Em)	4-2	9.10	10.30	1.20	.43	.49	+ .06
Auditory (Ea)	4-7	10.27	11.46	1.18	.48	.27	- .21
Visual (Ev)	4-6	7.00	12.00	5.00	-.24	.39	+ .63
Cognitive (Ec)	4-6	12.21	10.50	-1.71	.92	.05	- .87
Experimental (E)	4-5	9.89	11.02	1.13	.40	.16	- .24
Control (Cn)	4-7	8.83	10.90	2.07	.16	.14	- .02
Control (Co)	4-6	9.85	11.38	1.53	.39	.25	- .14
F. ITPA 9 - VISUAL-MOTOR SEQUENCING							
Motor (Em)	4-2	5.80	11.70	5.90	.08	.85	+ .77
Auditory (Ea)	4-7	7.27	11.55	4.27	-.33	-.04	+ .29
Visual (Ev)	4-6	8.60	12.30	3.70	.03	.16	+ .13
Cognitive (Ec)	4-6	10.50	11.43	.92	.53	-.07	- .60
Experimental (E)	4-5	8.24	11.71	3.47	-.07	.00	+ .07
Control (Cn)	4-7	8.32	10.56	2.24	-.05	-.30	- .25
Control (Co)	4-6	9.12	10.94	1.82	.16	-.21	- .37

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*S.S.-Deviation of the Standard Score from the age norm.

Growth for Boys in Areas Not Specifically Programmed. ITPA 6, Motor Encoding, posttest-pretest growth in raw score (r.s.) showed Ec boys gained 5.36 r.s. compared with the Co boys' gain of 1.72 r.s., and Cn boys' gain of 1.63 r.s. Corresponding standard score (s.s.) differences were: Ec +1.45 s.s., Co +.45 s.s., and Cn +.44 s.s.

Growth for Girls in Areas Not Specifically Programmed. Total motor posttest-pretest growth in raw score (r.s.) showed a gain for Ev girls of 8.20 r.s. compared with a gain for Cn girls of 5.71 r.s. and Co girls of 4.09 r.s. Corresponding standard score (s.s.) differences were: Ev +.86 s.s., Cn +.28 s.s., and Co +.21 s.s. (As reported on page D-9, Em girls made the greatest gain, 13.90 r.s. and +.98 s.s.)

ITPA 6, Motor Encoding, growth in raw score showed that Ec girls gained 4.50 r.s. compared with a gain for Cn girls of 2.24 r.s. and Co girls of .91 r.s. Corresponding standard score differences were: Ec +1.17 s.s., Cn +.58 s.s., and Co +.26 s.s.

ITPA 1, Auditory Decoding, growth in raw score showed that Em girls gained 8.00 r.s. compared with a gain for Cn girls of 3.66 r.s. and Co girls of 1.35 r.s. Corresponding standard score differences were: Em +1.03 s.s., Cn -.09 s.s., and Co -.52 s.s.

Beery-Buktenica Developmental Form Sequence growth in raw score showed Em girls gained 3.10 r.s. compared with a gain for Co girls of 1.65 r.s. Corresponding standard score differences were: Em +.74 s.s and Co +.03 s.s. (As reported on page D-9, Ev girls made the greatest gain, 4.10 r.s. and +1.06 s.s.)

ITPA 2, Visual Decoding, growth in raw score showed Ec girls an exception with a loss of -1.71 r.s. compared with gains for Cn girls of 2.07 r.s. and Co girls of 1.53 r.s. Corresponding standard score differences were: Ec -.87 s.s., Cn -.02 s.s., and Co -.14 s.s.

ITPA 9, Visual-Motor Sequencing, growth in raw score showed Em girls gained 5.90 r.s. and Ea girls gained 4.27 r.s. compared with gains for Cn girls of 2.24 r.s. and Co girls of 1.82 r.s. Corresponding standard score differences were: Em +.77 s.s., Ea +.29 s.s., Cn -.25 s.s., and Co -.37 s.s.

Summary of Growth in Areas Other than those Specifically Programmed. The only experimental sub-group of boys showing significant growth in an area other than that specifically programmed were the boys in the cognitive class who made a significant gain in the motor area.

Experimental girls in the motor class showed significant growth in three additional developmental skills areas (auditory, visual, and cognitive).

Experimental girls in the auditory-language class showed significant growth in one additional developmental skills area (cognitive).

Experimental girls in the visual class showed significant growth in one additional developmental skills area (motor).

Experimental girls in the cognitive class showed significant growth in one additional developmental skills area (motor), but a significant less in one developmental skills area (visual).

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The data gives partial support to the hypothesis that prekindergarten children who are provided with a personalized program based on individual assessment will show greater growth in the area of specific programming as well as in the cognitive process and the expressive process compared with children not participating in a developmental skills program.

APPENDIX E

DESCRIPTION OF TESTS USED IN THE INDIVIDUAL ASSESSMENT OF CHILDREN

The experimental prekindergarten design was based on a modification of Osgood's model (12,13) for developing intellectual abilities, Figure E-1. The model identifies three operations (reception, cognition, expression) necessary in intellectual growth. Operations are approached through the acquisition of five major developmental skills (motor, auditory, visual, cognition, and verbal), each interrelated and ranging from low to high meaning level. In the model, the arrows indicate that growth in developmental skills varies with individual children and does not necessarily follow a continuum.

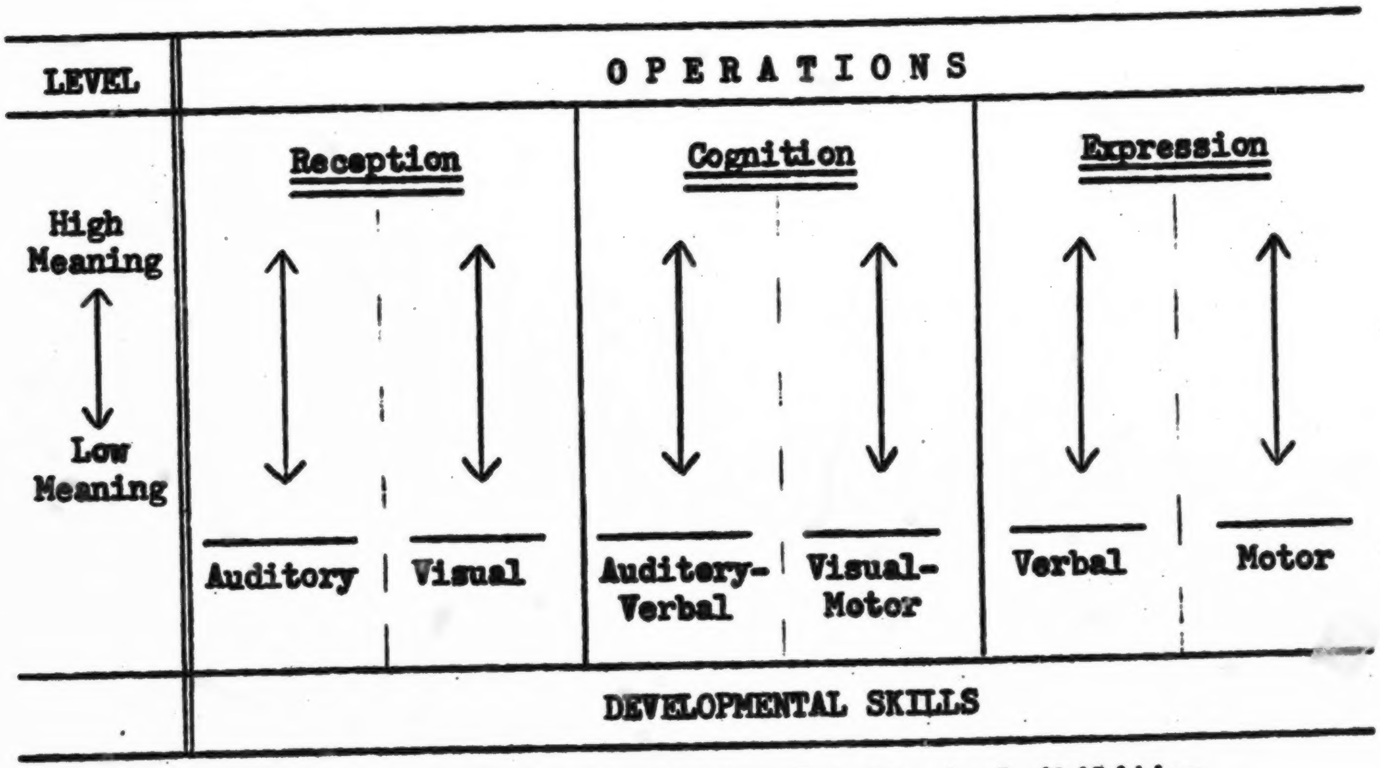
LEVEL
OPERATIONS
Reception
Cognition
Expression
High Meaning
Low Meaning
Auditory
Visual
Auditory-Verbal
Visual-Motor
Verbal
Motor
DEVELOPMENTAL SKILLS

Figure E-1. Model for Developing Intellectual Abilities

The tests used for individual assessment of developmental skills upon which personalized programs were provided to accommodate identified strengths and weaknesses are described in Table E-1. The tests which include the 17 dependent variables used in the prekindergarten studies are briefly described together with the major developmental skills area they are designed to measure (A-auditory, V-visual, C-cognitive, L-language, and M-motor).

Table E-1. Description of Tests and the Major Skills Area Measured

DESCRIPTION OF ASSESSMENT TESTS	Major Developmental Skills Area				
	A	V	C	L	M
Beery-Buktenica Developmental Forms Sequence. The perception of and ability to reproduce simple geometric forms.		X			X
ITPA DECODING TESTS. Understanding the meaning of words and symbols.					
Test 1. Auditory Decoding. The ability to comprehend the spoken word. Example: Do airplanes fly? Yes, No Do bicycles drink? Yes, No	X				
Test 2. Visual Decoding. The ability to comprehend pictures. Example: Picture of Shoe - Find another (different) shoe.		X			
ITPA ASSOCIATION TESTS. Relating visual or auditory symbols (ideas) in meaningful ways.					
Test 3. Auditory-Vocal Association. The ability to relate spoken words in a meaningful way. Example: I sit on chair - I sleep on _____. Coffee is bitter - Sugar is _____.			X		
Test 4. Visual-Motor Association. The ability to relate meaningfully visual symbols. Example: Sock goes with shoe, cup goes with spoon.			X		
ITPA ENCODING TESTS. Putting ideas into words and gestures.					
Test 5. Vocal Encoding. The ability to express ideas in spoken words. Example: Tell all about a - - - Ball, chalk, block, celluloid.				X	

Table E-1. (continued)

DESCRIPTION OF ASSESSMENT TESTS	Major Developmental Skills Area				
	A	V	C	L	M
ITPA ENCODING TESTS. (continued)					
Test 6. Motor Encoding. The ability to express one's ideas in gestures.					
Example: Gun - point, pull trigger. Telephone - dial, put to ear.					X
ITPA AUTOMATIC TESTS. Handling syntactical and inflectional aspects of language without conscious effort.					
Test 7. Auditory-Vocal Automatic Test. The ability to anticipate what will be said based on what has already been said.					
Example: Here is a bed, here are two beds.				X	
ITPA SEQUENCING TESTS. Reproducing a sequence of symbols.					
Test 8. Auditory-Vocal Sequencing. The ability to repeat a sequence of symbols previously heard.					
Example: Repeating 2 to 8 digits.			X		
Test 9. Visual-Motor Sequencing. The ability to reproduce a sequence of symbols previously seen.					
Example: △ □ ○ ⬡ etc.			X		
TOTAL ITPA L.Q. Composite Score. Derived from chronological age and total standard score.	X	X	X	X	X
Gross Motor Tests. Body balance and control					
Hopping-Right Foot. Seven times					X
Hopping-Left Foot. Seven times					X
Skipping					X
Total Motor Skill. Includes hopping, skipping and the three items below. Walking a 2 x 4 board forward and backward. Schilder Test- - - arms extended forward at shoulder height, eyes closed. Steps - ascending and descending.					X

Table E-1. (continued)

DESCRIPTION OF ASSESSMENT TESTS	Major Developmental Skills Area				
	A	V	C	L	M
Peabody Picture Vocabulary Test, I.Q.			X		
Three-Dimensional Auditory Discrimination Test.* Using toy objects. Example: This is a mouse; this is a house. Give me the house.	X				

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*Devised locally.